APRIL, 1951

RAILWAY Mechanical and Electrical Engineer

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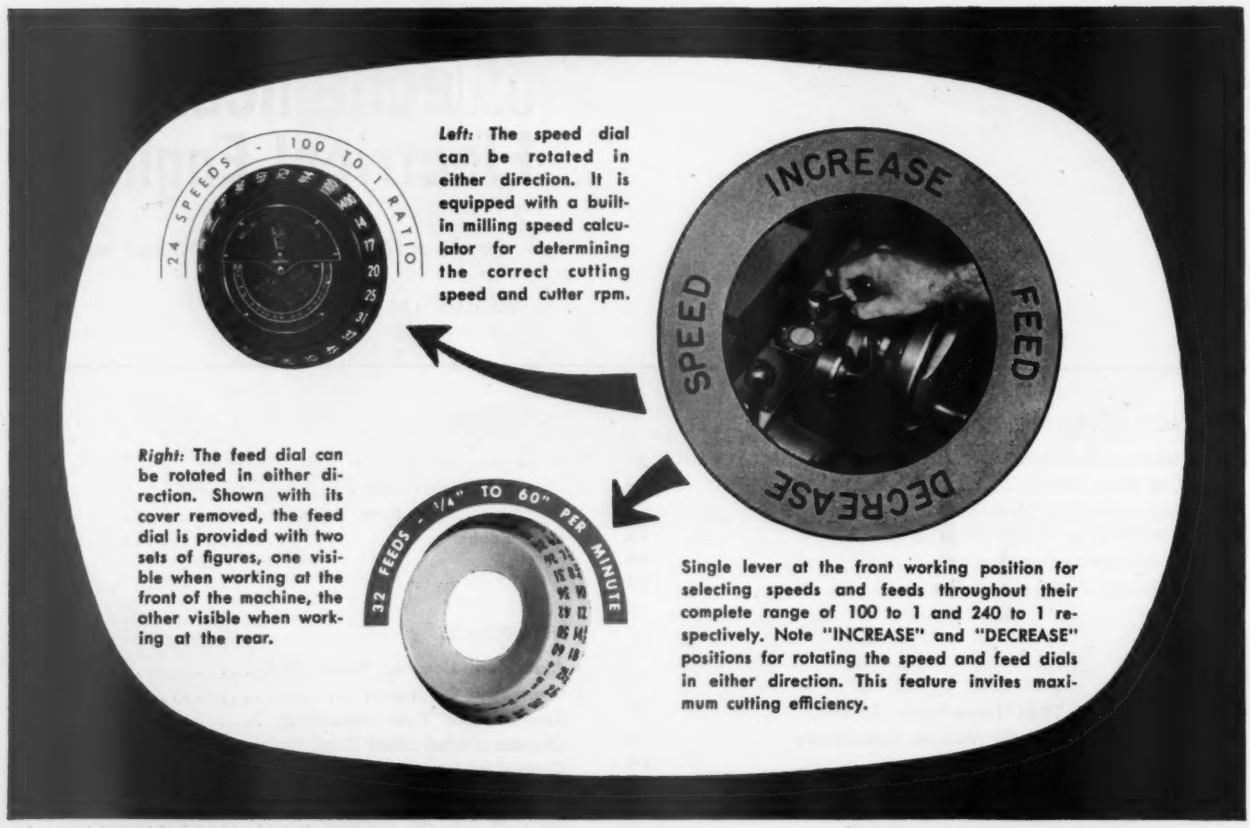
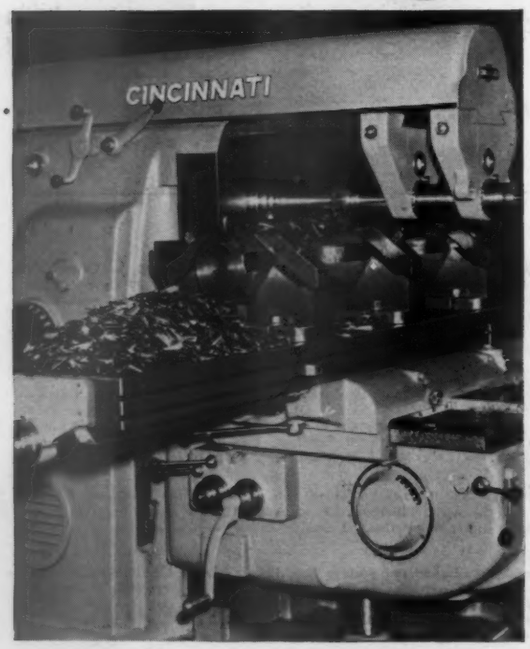


Left: The speed dial can be rotated in either direction. It is equipped with a built-in milling speed calculator for determining the correct cutting speed and cutter rpm.

Right: The feed dial can be rotated in either direction. Shown with its cover removed, the feed dial is provided with two sets of figures, one visible when working at the front of the machine, the other visible when working at the rear.

Single lever at the front working position for selecting speeds and feeds throughout their complete range of 100 to 1 and 240 to 1 respectively. Note "INCREASE" and "DECREASE" positions for rotating the speed and feed dials in either direction. This feature invites maximum cutting efficiency.

High Power and Dual Power Dial Type Milling Machines have labor-aiding power speed and feed change. Built in Nos. 3, 4, 5 and 6 sizes; plain and vertical styles; Nos. 3, 4 and 5 sizes in universal style. Catalog M-1644 for High Power Dial Types; M-1647 for Dual Power Dial Types.



ONE LEVER

SELECTS THE RIGHT SPEED AND FEED FOR THE JOB

It's almost as easy to do as to talk about it. That's why operators really like the High Power and Dual Power Dial Types. They're big, rugged, take heavy cuts (up to 50 hp for the largest sizes), yet they're exceptionally convenient and easy to run. This one Cincinnati feature of power speed and feed selection, at the *front and rear working stations*, goes a long way toward reducing milling costs. Efficient cutting becomes a habit with the Dial Type operator because it's so easy to select the right combination of speeds and feeds. There are other features, too, of interest to both shopmen and management. You will find them outlined in two attractive catalogs: Nos. 3, 4, 5 and 6 High Power Dial Types, M-1644. Nos. 3, 4, 5 and 6 Dual Power Dial Types, M-1647.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

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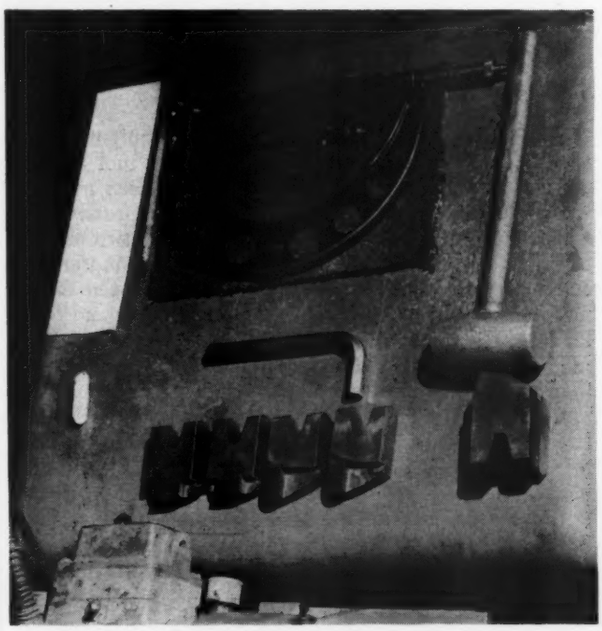
RAILWAY Mechanical and Electrical Engineer

Modern Shop Tools and Visual Instruction in Their Use*

Design, manufacture and use of cutting tools on the Southern Pacific, particularly in wheel and axle work, are described in this paper

By F. E. Molloy†



Good housekeeping generally means good workmanship

PRIOR TO 1933 almost all cutting tools were made of carbon steel. Little high speed steel was used, except on highly specialized jobs, because of lack of facilities for proper heat treating and hardening. However, during the following ten-year period high speed steel gradually came into more general usage.

In 1943, so as to be in a position to handle the high-speed tool steels, the Southern Pacific purchased and installed at Sacramento general shops an atmospherically controlled electric heat-treating furnace. With this equipment it was possible to extend the use of high speed steel to machine cutting tools, reamers, milling cutters and many other applications. This resulted in sizable savings in tool inventories, maintenance and production labor costs.

During World War II the amount of high-speed steel available declined sharply, and in order to conserve the supply the practice of tipping of cutting tools was begun. This proved to be so economical that it was almost universally adopted as standard practice. For example, just prior to the time we started using locomotive tire steel, obtained from the stores department reclamation plant, for making tool shanks, milling arbors and other tool holders our consumption of high speed steel was approximately 36,000 lb. per year. This has dropped to approximately 16,000 lb., a 56 per cent decrease.

Stellite and carbide steels were introduced during 1939. For several years following that date they were used principally for trial purposes and in comparison to high speed steels. Their application for production work was strictly limited.

Since World War II, carbides and cobalt products have become quite popular as general cutting steels. Among the advantages of carbides over high speed steels are:

1. Tool life, in terms of time between regrinds or reprocessing, is increased considerably. For example, when boring and turning locomotive side rod bushings with high-speed steel tools it was necessary to regrind the tools two or three times in an eight-hour shift. When carbide tools are used the tool life between regrinds is approximately three eight-hour shifts.

2. Carbide steels will easily cut through abrasives, such as are present on most sand castings, and hard spots like those found on locomotive tires and steel wheels.

3. The ability of carbides to cut metal at much higher temperatures makes it possible to operate the machines at faster speeds, increasing their productivity and providing a higher rate of return on the investment in the machine.

To obtain the benefits which carbide tools can provide, the machines in which they are used must have ample horsepower and a wide range of speeds and feeds. Accepting this fact, it then may be necessary to rebuild and modernize some of the older machines. At Sacramento general shops our first step in the modernization program was to remove all line shafting and belting and

* Abstract of a paper presented before the Pacific Railway Club, October 19, 1950.

† Assistant superintendent of motive power, Southern Pacific, Sacramento, Cal.

Left: Shaping machine cutting shelf on tool shanks to receive tool tips. Right: Method of applying high-speed tool tip to tool shank

Checking wheel-seat diameters in carding sizes to be used for wheel boring

apply individual drive mechanism to the various machines. Obsolete machines were scrapped, and others were redesigned. In addition, we purchased a number of modern turret lathes, boring mills, milling machines, engine lathes and other equipment, enabling us to make wide use of carbide tools and increasing our production.

Power and Tool Costs Reduced

In addition to increased production, there are two items, frequently overlooked, which effect cost reductions when machinery is modernized or new equipment purchased. These are power consumption and tool cost, including the cost of tool service life. A modern machine, having ample power to produce a constant torque over a wide range of speeds and feeds, may replace two or three older machines, each of which has a drive motor consuming electric power. Our experience has been that in many instances cash savings in tool inventories and maintenance, resulting from the purchase of new machines or modernization of existing shop machinery, are greater than the savings in direct labor.

An important factor in obtaining maximum efficiency from cutting tools is the system used in manufacture and maintenance. At many shops on our system this is handled by a centralized tool department equipped with modern tool grinding equipment, and all tools are ground to standard design by experienced operators. An additional function of the central tool department is a tool delivery service. A service wagon is used to deliver tools to the machines where they are to be used and to pick up worn tools and return them to the tool room for regrinding. We have also installed modern tool cribs to replace older tool storage spaces, and this has enabled us to further cut tool inventories and reduce overhead on tools and other supplies. It has been found that this method of handling tool processing and distribution results in appreciable savings.

Tool service life is usually figured on the basis of the number of pieces of finished work obtained per regrind. Experience at Sacramento shops indicates longer tool service life can be realized if the operator hones the cutting edges during the period between regrinds. The honing removes any soft metal which may build up on the cutting edge. This soft metal, if not removed from the tool edge, will become wedged between the work piece and the cutting edge and cause cratering and breaking down of the tool. The time required to hone the tool occasionally is negligible and the amount of work obtained from the tool before it must be returned to the tool department is increased considerably. Total tool life

can be extended by the practice of removing the tool before a complete breakdown of the cutting edge takes place. When this practice is observed the regrinding time and the amount of metal removed from the tool will be reduced.

Education of Personnel

The first step in the training of mechanics is our apprentice program. During apprenticeship the prospective mechanic is thoroughly instructed in the fundamentals of his trade. With the constant developments being made in machines and machining methods it is necessary that the training and education be carried on continuously and for this reason we recently undertook a visual aid program, consisting of motion pictures of various shop operations.

Two pictures, made at Sacramento general shops, are entitled "Processing and Use of Machine Tools" and "Machine Cutting Tools—Their Selection and Application."

The first picture covers the manufacture of machine tools and their application in the machining of car axles and wheels. The various steps in the manufacture are shown, from drafting room to blacksmith shop where the shanks are forged and high-speed steel or carbide tips are applied, and to the tool room where they are ground and tested. Following this, the necessary operations in preparing axles and wheels for mounting are shown, including proper use and care of the tools and machines, machine speeds and feeds, etc.

The second picture deals with tool design and maintenance, selection of the proper tool for a given job, and selection of the correct machine speeds and feeds for the job using the selected tool. The results of improper grinding of tools and of poor selection and application on both the tool and the work are shown.

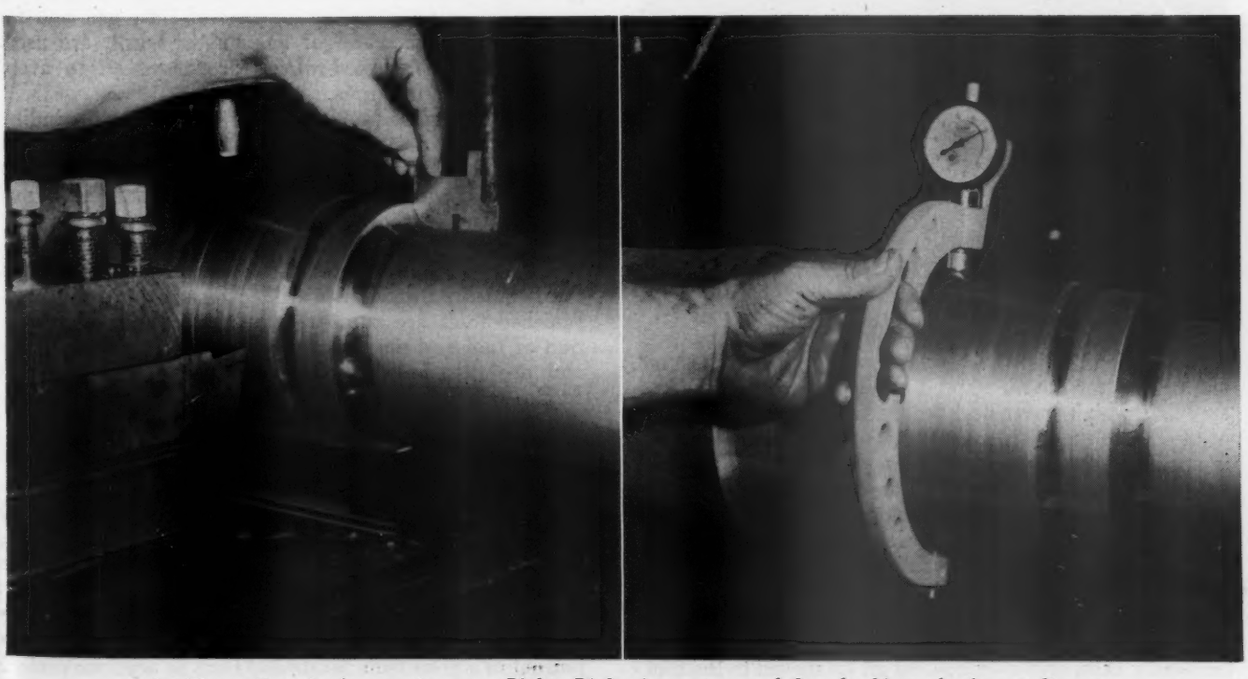
The pictures have been shown to supervisors and mechanics at various shops on our system and have also been shown to personnel of other railroads, and were shown at the Locomotive Maintenance Officers' Association convention held at Chicago last September. The reception indicates that there is a definite need for this type of visual aid training. We hope, in the future, to make additional visual aid pictures of other phases of shop practice for the education of our employees.

Cutting Tool Manufacture

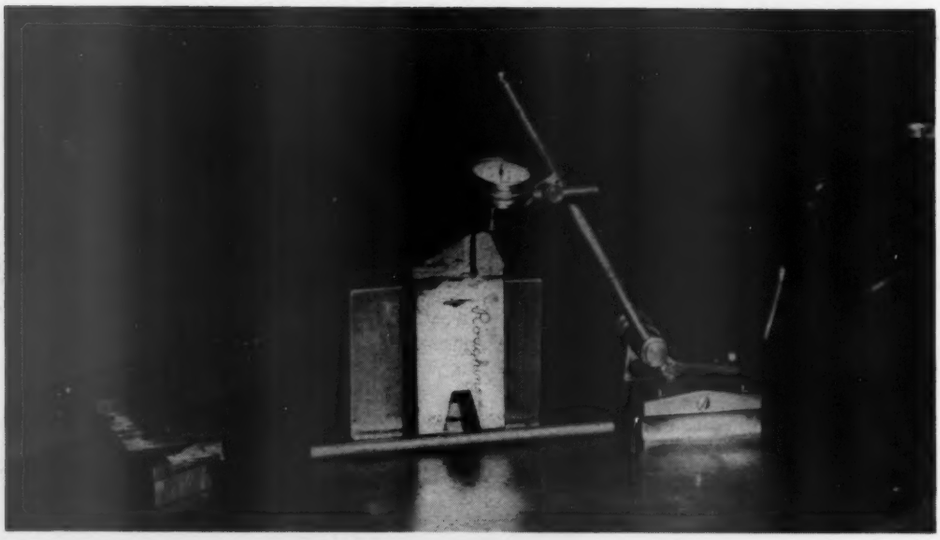
Tool design is the foundation for proper cutting tools. Competent draftsmen with necessary experience, in conjunction with tool room personnel, design our tools. All plans are standardized and are placed in our standard tool folio. Tools are ordered by tool folio plan numbers and those manufactured at Sacramento are distributed over the system.

When a new tool is to be manufactured, the first step

Equipment for the Magnaglo testing of axles



Left: The radius check gage in use. Right: Dial micrometer used for checking wheel seat diameter



Method of matching Davis boring-bar tools for correct length

Sizing of Davis boring-bar tools for finish boring

is the forming of the shank. This is made from locomotive tire steel, which is reclaimed by the stores department. The steel is heated to 2,250 deg. F. and re-formed into a rough tool shank by a 1,200-lb. steam hammer. The shank is then measured and cut on an anvil to the proper length.

From the toolsmiths the shank goes to the toolmakers, where a shaping machine is used to form a shelf on the cutting end for the high speed or carbide steel tip. When applying a high speed steel tip, flux is placed on the shelf of the shank, the tip is carefully positioned and more flux is applied to assure a uniform weld. The shank and tip are placed in the number one—pre-heat oven and heated to 1,550 deg. F. They are next moved to the second oven where they are heated to 2,375 deg. F., which is required to fuse the metals to form a satisfactory weld. From the high heat oven the metals are taken to the tipping press, where the tool tip is carefully pressed to the tool shank shelf. The final operation is to place the tool in an oil tempering bath, and after cooling git iis moved to the tool shop for finishing.

When brazing a carbide steel tip to a tool shank, flux is first applied to the shank and tip together with silver solder, the brazing medium, and the tip is then positioned. A torch is adjusted to produce a non-oxidizing flame and is applied to the bottom of the shank with continuous motion. The flame is also applied to the sides and some on the top. When the silver solder melts, the flame is removed and the tip is held firmly in place until the braze sets and cools.

Correct Grinding Highly Important

In the tool shop, where the final grinding of tool tips is performed, it is of the utmost importance that tool folio plans be understood and adhered to, as the tools must be precise to meet the rigid duty imposed upon them. The tool radii and cutting angles must be correct.

Carbide tools are ground to shape on a carbide tool grinding machine. Carborundum or crystalon grinding wheels for rough grinding a wheel of sixty grit and for finish grinding a wheel of one hundred grit, are used. These specially selected wheels are very soft to avoid setting up heat fractures.

Davis boring bar tools are put through two grinding machines, the first for grinding the cutting edges, and the second for grinding the chip breaker. These tools are ground anad matched in pairs. The size must be exact and the dimension from base to cutting edge is carefully checked with a dial indicator gauge.

All tools manufactured at Sacramento must be tested for Brinnell hardness as specified on the tool folio plan. Finished tools are numbered and lettered for identification of tool and machine on which they are to be used, and are distributed through the shops with the tool service wagon.

Machining Car Axles

Worn wheel and axle assemblies are shipped to Sacramento shops for replacement. Wheels are demounted and scrapped and axles, after being inspected and classified, are sandblasted to remove grease, dirt, paint and scale accumulated in service and are returned to the shop.

The first step in processing an axle is re-centering. The operator carefully fits a reamer attachment over the journal in a position to locate and bore an accurate center. The axle is then placed on the main axle rack.

From the rack the axle is removed to the axle lathe by a special type lifting-arm which supports it in balance while it is being placed between the lathe centers. The machinist hones any feather edges left on the tool before positioning it in the four-way block. The tool is set with the cutting edge $\frac{1}{32}$ in. above the axle center line. The machine controls are then set for correct speed and feed. The carbide cutting tools operate efficiently at a cutting speed of 200 surface f.p.m., and when machining a 7-in. diameter wheel seat the correct speed is 100 r.p.m. with $\frac{1}{32}$-in. feed.

A light cut is first made on the collar end of the journal, and only enough metal is removed to clean up the out-of-roundness. The tool is moved slowly toward the collar, with the machine operating at normal speed. The machine is then reduced to a jogging speed in order to produce a highly polished surface on the collar fillet. The jogging speed is also used when machining the $\frac{3}{4}$-in. fillet on the dust guard end of the journal. The final finish of the journal area, produced by a burnishing lathe, matches the polished radii at either end of the journal.

Wheel seats are turned to one of four standard sizes ranging from $\frac{1}{16}$ in. to $\frac{1}{4}$ in. under the new wheel seat diameter. This is done to reduce re-setting of wheel boring tools.

All fillets are carefully checked with a fillet gauge and a dial micrometer is used to check the wheel seat size.

The final step is a Magnaflux or Magnaglo test to determine whether the axle has any internal fissures or surface fractures. The axle is then returned to the axle rack, where the lead machinist measures the wheel seats, marks the sizes on the axle and makes a record for distribution to the boring mill operators.

Chilled iron wheels, which are manufactured in the foundry at Sacramento, are placed in the boring mill using a modern electrically operated hoist and are centralized in the machine with an automatic chucking device.

The carbide tools used for the roughing cut are set to a diameter approximately .050 in. smaller than the finished size. They are perfectly matched to produce a straight and round bore. The middle bar tools are set, making proper allowance for pressure fit, from the list of sizes furnished the operator by the lead machinist. Above these finishing tools is the single fillet tool used to form a radius on the edge of the wheel bore, which enables the wheel to properly position itself when being press mounted on the axle.

The machine is operated at speed of 95 r.p.m. for the roughing cut, using a feed of $10\frac{1}{2}$ in. per min. For the finishing cut the same speed is used, but feed is increased to $14\frac{3}{4}$ in. per min.

The finished wheel is then removed from the boring mill and moved to the mounting press.

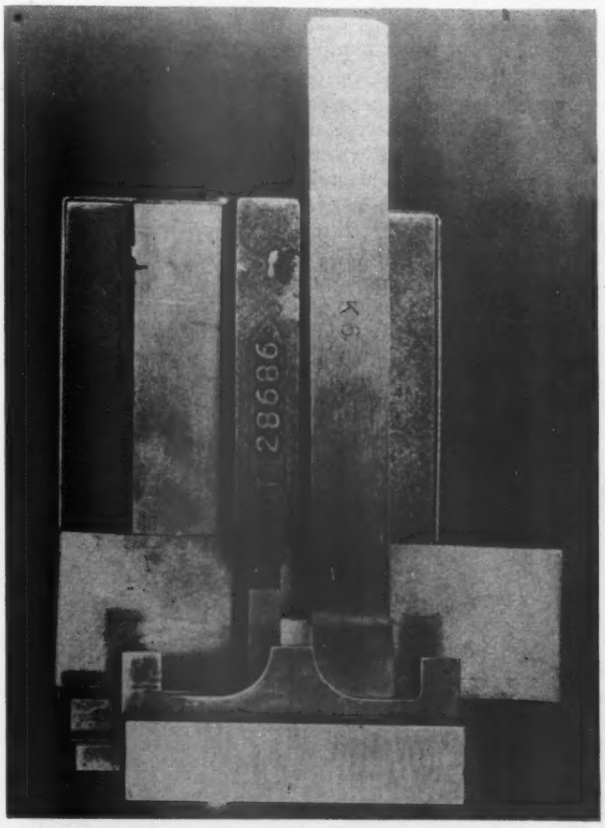
Mounting Cast and Steel Wheels

The hydraulic mounting press is located at the out-bound end of the wheel shop, in direct line with out-bound wheel storage or shipping tracks. The press is equipped with a gauge, which should register between 45 and 70 tons when cast iron wheels are being mounted. The pressure is also recorded on a paper tape with other identifying data.

After the wheels are mounted on the axles, final approval of the assembly must be given by the inspector. Following this approval, paint is applied to the highly finished journals to provide protection from the elements during shipment and until the wheel assemblies are applied under cars. The entire journal surface as well as the axle end is painted.

The final operation is loading the wheel assemblies on special wheel cars for distribution to various points on the system.

Honing tool to remove all feather edges after grinding for longer tool life



Check gage for use when grinding axle-cutting tools

By Dave Andrews

Our First Diesel

THE fact that most railroads were rapidly changing from steam to diesel power was not unknown to the employees and management of our small northern railroad. However, we all felt, "it can't happen here."

We couldn't visualize anything except a chugging steam engine hauling a string of freight cars through the foothills and past the lakes and streams of this wilderness country. However, rising costs of steam maintainance plus the ever-increasing difficulty of getting parts for the rapidly disappearing iron horse exerted pressure on a road needing new power—this little road certainly needed some new power.

One day about a year ago, a group of influential looking men walked through our shop and into the office. Then the rumors started. Fire cleaners, hostlers, boilermakers or blacksmiths all could give you the lowdown—those guys were diesel men. Strangely enough they were right and "those guys," spent the next few days making a survey of our diesel requirements right down to the last oil filter and brake shoe.

Mechanical department employees are but little interested in the kind or type of locomotives used by their employer. Whether it is steam or diesel matters but little, it has to be maintained and that is their job. On small railroads the picture changes, the railroad is in the workers blood. In a small town everyone knows everyone else's business and the railroad is a way of life to them. On a short line road serving a farming community most of the help comes right out of school. Their fathers before them were railroaders and if the road continues to run their sons and grandsons will probably be railroaders too. To these men diesel power could be catastrophic. One of the major economies of diesel power is maintainance cost and that means less man power.

Some months after the visit of the diesel men it became obvious that something was in the wind and what had heretofore been a mere topic of conversation now became a sharp tool to deepen the grooves in many foreheads. Everyone took his seat on the anxious bench and proceeded to wonder how secure his job was.

Some of the non-believers pooh-poohed the idea saying, "where would a railroad that can't pay standard wages get the money to buy diesels." How wrong they were was soon to be demonstrated for one morning when the men came to work there was a new shiny 1,600-hp. road switcher straddling a pit as comfortably as if it had been there for years. One sure way of drawing a wide eyed and curious crowd is to move a diesel into a steam shop. This one was no exception. By the time the starting whistle blew the men were standng six deep all around it and the foremen had a tough time to get them to work. Even then, work was done between peeks at the sleek monster on No. 2 pit.

Soon a group of service men appeared in work clothes and the initial servicing of a diesel demonstrator began. I won't bore you with all the details of inspecting traction motors and suspension bearings and all of the myriad of major and minor operations needed to ready a locomotive for service. Enough to say, by nightfall we had gone through our indoctrination period in diesel inspection and repair and the unit was ready for service.

The next morning our first diesel was ready to make a test run with a full tonnage train to our northern terminal, there to couple on to the other side of this freight job and back again. This run takes about 24 hours. When the train pulled out of town the diesel cab was so crowded with men that it looked like a rush-hour street car.

The ensuing days found the unit performing as a good diesel should, covering the road in good time with full tonnage trains against adverse weather conditions with a minimum of fuel consumption. With the exception of adding lube oil, changing an occasional brake shoe and adjusting the sanders we had little to do with the unit mechanically. In fact, we in the shop marveled at the small amount of repair work needed to keep this type of locomotive in service. However, this myth about no work on a diesel was soon to explode around our heads like a miniature atom bomb, because when the unit returned from the northern run it was discovered that one of the motor suspension bearings was running hot. The unit was immediately brought into the shop where a more thorough inspection could be made. This inspection verified our deepest fears, the bearing was completely ruined.

We turned to the service man who was with us at the time and asked, "What do we do now?" We sure were babes in the wood when it came to repairing this outfit. He replied that there was nothing to do but remove the traction motor and wheels and replace it with a new assembly. By this time it was four o'clock in the afternoon and he had to hurry to the office to call his boss and make arrangements for a new assembly to be shipped to our shop. After a lengthy telephone conversation he appeared with the information that there would be a new outfit shipped by truck to arrive at the shop at four a.m. the next day. "And now," he said, "all we have to do is take the old one out." He might just as well have told us to push the *Queen Mary* away from its dock with a hand full of broom straws. I suppose the poor fellow thought ti himself, "what a dumb bunch of so-called mechanics." I don't know that we ever exonerated ourselves but we certainly worked hard enough trying.

This lad knew what had to be done, but how it was to be done in a shop with no diesel facilities was something entirely different. We knew, naturally, that it had to be over a drop pit so we moved the engine over our standard pit for removing one pair of steam locomotive drivers. Common sense told us it had to be jacked and blocked so we did that. Now the actual removal of the traction motor unit began. We had disconnected the power cables and the brake rigging and put some small horseshoes in the spring next to hold the tension on the springs of the nose suspension. Next, we jacked and blocked the equalizers and removed the spring nest. Our pit is equipped with the usual hydraulic jack with the standard cap on the top

of the ram made to accommodate a locomotive driving axle.

If you ever care to see a useless piece of apparatus, gaze up at the bottom of a traction motor and then at a standard pit jack and try to find a place to jack against solid and secure enough to drop a six-ton assembly the three feet needed to get it out from under a diesel. I never felt so utterly defeated. After much looking and sifting out of ideas we placed a 30-in. length of 80-lb. rail under the heads of the suspension bearing cap bolts and with the rail hitting on the top of the ram cap we took a little strain on the assembly. Luckily it held and raised the truck sufficiently to block the equalizers and hold them in position. Everything was ready now with the exception of removing the safety straps or binders, as we insisted on calling them.

This done, the actual lowering was about to begin. We all got into the clear and, operating the jack with a lever long enough to give us sort of a remote control, we let it down a few inches. Far enough to discover that we had still another condition to combat, namely, the overhang of the motor fingers over the truck frame. In other words we found that the motor could not come straight down, the back end would have to be raised and then the entire assembly dropped at an acute angle. This required more study with the final solution being to crib up in under the back side of the traction motor and with a 35-ton journal jack raise the rear of the motor about four inches. We had the assembly in the proper position to lower but now instead of one jack to manipulate there were two. Holding our breath while this heavy and awkward unit teetered precariously on its improvised support we let it down about three inches. We had to block and crib our stubborn baby and reset the jacks so we could lower it a few inches more. This went on for hours and at 3 a.m. it was down far enough to clear the pedestals.

To slide this mass of steel and copper out from under the locomotive was our next problem. Again we carried blocking until the entire drop pit was a giant crib and our backs were numb with lugging heavy wooden timbers through a dimly lighted shop where we continually barked our shins against outcropping pipes, bars and parts of locomotives. A snatch block was anchored in one end of the pit and a cable stretched from the overhead crane through the sheave and one end fastened to the motor. We gave the craneman a lift signal and slowly the motor skidded out from under the locomotive. Soon it was exposed enough to fasten the crane into the lifting eyes on the motor, then it was a short job to set it out on the floor, finally safe and secure. It was now 4 a.m. and we were a tired and greasy bunch of men but satisfied that we had accomplished a job that 12 hours previous had seemed utterly impossible.

Installing a new assembly was mere child's play for now we were acquainted with our problem and could go about it in a business-like manner.

The new parts came separately and had to be assembled. While this was being done we made a cradle out of some 6-in. by 10-in. oak timbers long enough to reach under the locomotive with a foot or so of the cradle exposed on each side of the running board. This was wide enough to accommodate the traction motor assembly safely. The cradle was dropped into the pit by the shop crane and placed on several 3-in. pipe rollers, in the center of which we placed two short pieces of 80-lb. rail about 2 ft. apart. On the back end of these we secured a 4-in. block of hard wood to establish an angle so that additional jacking once the unit was up in place would not be necessary. The new motor and wheels were dropped down onto the cradle with the back side of the motor on the block. A spreader with suitable cables was dropped down alongside the locomotive and fastened to the cradle taking care to have lift enough to raise the unit up into the jaws. When all was in readiness we gave the craneman the high sign and in a matter of minutes the assembly was in place. The safety straps were applied, the cradle removed and it was a brief chore to raise the unit and replace the rails. Connecting the power cable and replacing the brake rigging was a short job and our first diesel was again ready for service.

We had replaced an assembly in about three hours that had taken us twelve to remove. Believe me we won't take so long or work so hard next time.

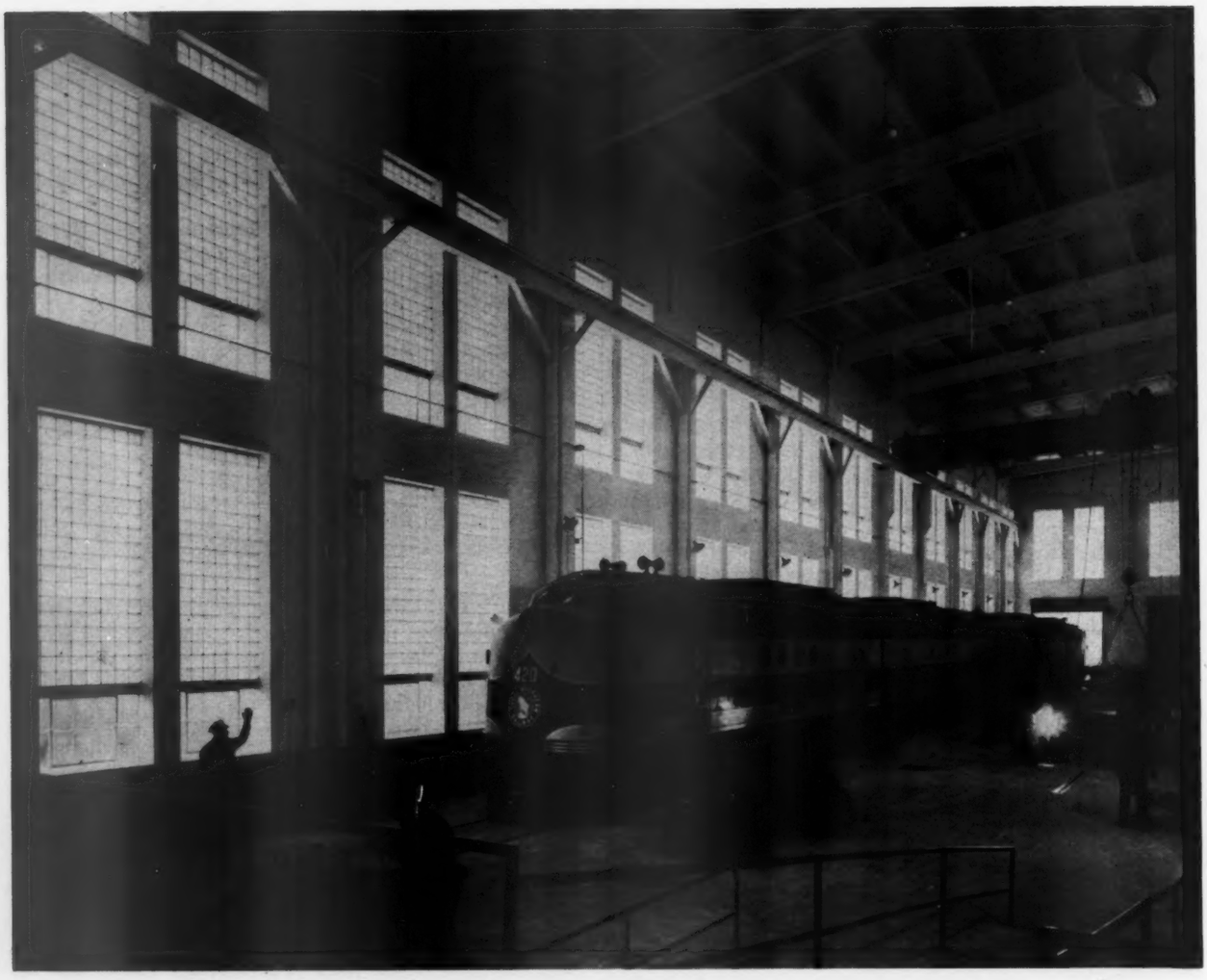
Increasing Life of Driving Box Liners

The Battle Creek, Mich., shops of the Grand Trunk Western has increased the life of driving box shoe and wedge face liners by facing the back of the liner. The facing lengthens liner life by reducing the tendency for the liners to work loose.

The shoe and wedge cast brass liners, for application to the faces of boxes, are faced on a boring mill equipped with a special holding fixture that is readily applied or removed. Two clamps and four set screws secure the liner in place, with the setup time taking about a minute. One clamp is removed and the liner slipped under the second clamp, which is tightened. The second clamp is then slipped over the liner and tightened in place. Both clamps have a nut and long bolt which slides in a slot at the end of the holding fixture, and are tapered to mate with the taper of the liner. The four set screws take up side play.

The holding fixture is fastened to a second holding fixture; the latter is permanently mounted on the boring mill for machining hub face liners. The backs of these liners are also faced to increase the wear life.

Holding fixture for facing the back of driving box liners—The liner slips under the clamp at the far end, after which the clamp lying on the table is placed over the near end of the liner—The small set screws take up side play



This installment of a discussion of requirements for maintenance facilities for diesel locomotives deals with the conversion of shops and enginehouses

Facilities for Diesel Repairs

*By R. H. Herman**

Small Maintenance Shop

The smallest facility would be one required for periodic maintenance of one or more Diesel switcher locomotives in a yard, terminal area or on a branch line. It is not practical to provide elaborate facilities for only a few locomotives and all heavy work would be performed at another shop or equipment returned to the manufacturer or a service shop for attention.

It is common practice to partition off two or more stalls in an enginehouse from the steam locomotive section for Diesel maintenance work. Yard switchers are normally brought into the shop once a month for I. C. C. inspection, requiring approximately eight hours, at which time progressive maintenance work is performed. Daily inspections can usually be made on an outside track between shifts. Road switchers are usually operated and maintained on a mileage or time schedule and may be brought once a week or oftener for maintenance.

The conventional depressed floor and platform arrangement in such a small shop is not economically justified for a few locomotives, however, stationary or movable platforms at running board level are very desirable. Machinery and equipment is limited and generally comprises only a small drill press, emery grinder, high voltage test set, valve seat and face grinders, equipment for filter and parts cleaning, test meters, gauges, wrenches and hand tools.

Fuel oil storage, pumping and disbursing and sanding facilities are essential. Lubricating oil for change or makeup can be supplied from drums and water from existing services. Sand may be obtained from the spout or connection at an existing steam locomotive coal chute.

It is generally necessary that some means be provided for changing wheels or traction motors since considerable service time would be lost and expense involved in moving the switcher locomotive to another shop for such work. New drop table facilities are not economically justified for a few wheel changes a year, however, if a steam locomotive drop table is available it can be used to good advantage. It is possible to change wheels using pneumatic jacks to raise the cab, blocking and alternately lifting one end and then the other until truck can be released. After the truck is removed an existing hoist, crane or even a wrecking derrick can be used to raise the truck and release a pair of wheels. This method is slow and costly and only justified where a few pair of wheels must be changed.

Branch Line Maintenance Shop

A slightly larger progressive maintenance shop would be required to handle periodic inspection and maintenance work on six or more Diesel road switchers operating in branch line service. In a shop of this type it is probable that depressed floors and platforms would not be justified since satisfactory work can be performed from movable platforms at running board level.

A satisfactory arrangement can be installed in a roundhouse or preferably in a rectangular building, if available for conversion. At least one inspection pit should be provided inside the building long enough for a Diesel locomotive unit, together with space for office, wash and locker rooms, toilets, storehouse and work space for filters and parts. Motor driven exhaust ventilators or equivalent means for removing fumes from the building are a necessity.

Since a number of wheel changes will be required each month, some means should be available for this purpose. A transfer table or drop table for either single pair of wheels or truck is very satisfactory but relatively costly. For such an application, four 35- or 50-ton electrically-operated portable jacks are a satisfactory substitute at a lower initial cost. The four jacks are operated in unison to raise the locomotive cab and the truck is rolled out endwise. An existing hoist or crane of 5-tons or greater capacity, or a new crane, can then be used to remove wheels and motor from the truck.

The crane would also be available for loading and unloading wheels, motors and other heavy parts and, if of 10-ton or greater capacity, it can be used to lift out a Diesel engine after it has been stripped down to within the capacity of the crane. Normally it should not be necessary to remove the engine or do heavy repairs at such a relatively small shop.

The facilities outside the building should include fuel oil storage, pumping and disbursing systems, sanding arrangement and a wash track. If the locomotives arrive in the shop area at frequent intervals for turnaround inspection an outside inspection pit is a very desirable feature.

As the number of locomotives to be maintained at a given shop approach 30 or more, depressed floors and platforms are justified from the standpoint of ease and economy in maintenance. A greater amount of floor space is required for parts reconditioning work, filter cleaning, wheel and motor storage, storehouse, wash and locker rooms as well as space for overhaul of batteries, radiator cooler cores, and even Diesel engines.

A wide variety of shops for this purpose have been built and placed in operation by Diesel railroads ranging from complete new shop facilities of the conventional rectangular design to inspection pit tracks in a steam locomotive erecting shop, machine shop or even in a roundhouse. In the early days of Diesel operation, planning was principally on the basis of new shop facilities of rectangular design with depressed floors, platforms and servicing facilities. This procedure was usually necessary at that time because of the need for existing facilities to handle steam locomotive work. More and more Diesel-electric locomotives are being purchased and it is not difficult to foresee the day when divisions or railroads will be completely Dieselized. Heavy repair shops, roundhouses and numerous shop buildings will not be needed in the future for steam locomotive work, and if not utilized for other purposes must be retired and dismantled.

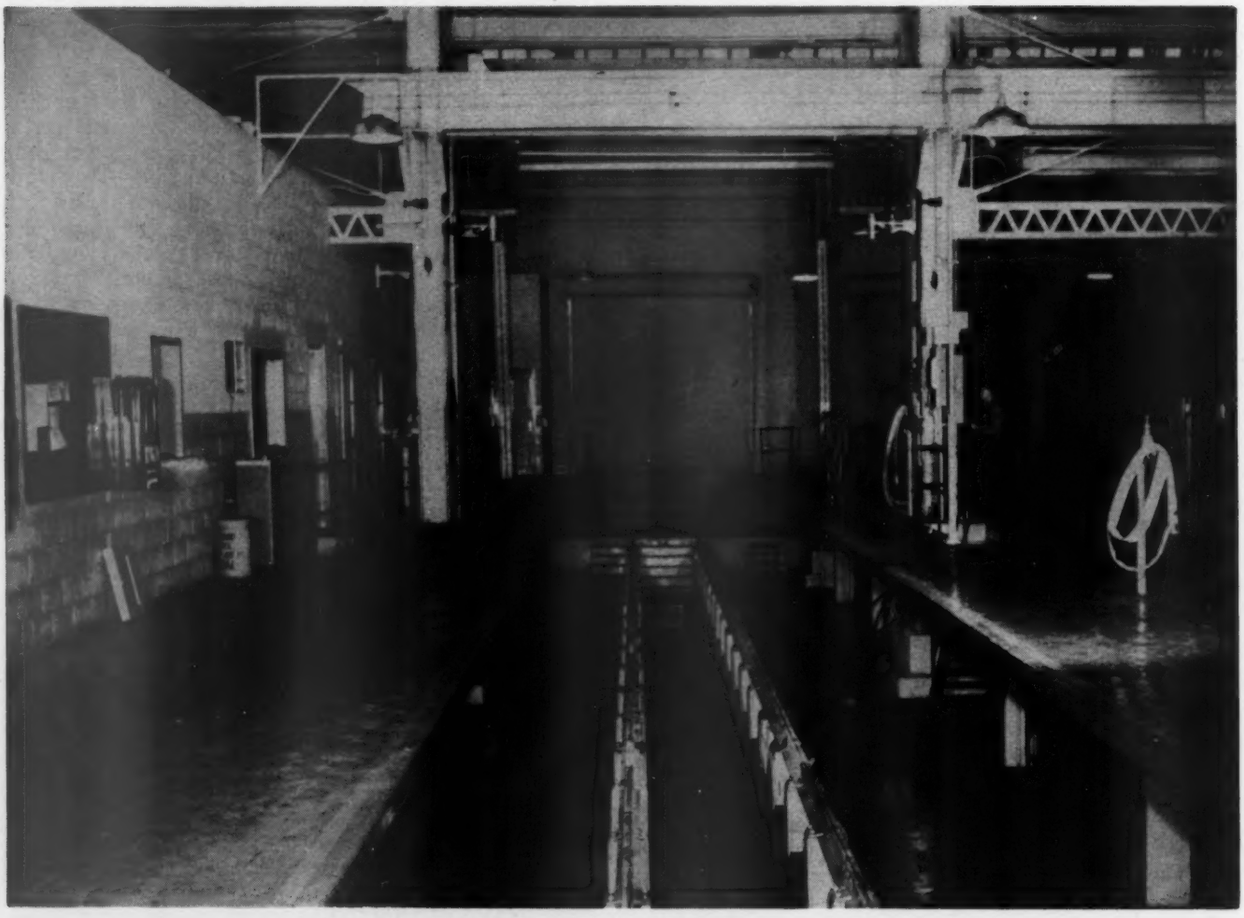
There is a most important question of economics involved and it is obvious that railroad managements cannot afford to make the large expenditures required for completely new buildings for Diesel maintenance work and ultimately to retire practically all the structures formerly used for steam locomotives. It is possible to provide satisfactory and efficient maintenance facilities in an existing building or even a roundhouse at a cost only one-third the cost of a complete new shop.

It is essential that full consideration be given to the conversion or alteration of existing buildings before a decision is made to construct a completely new shop.

New or Converted Maintenance Shops

Progressive maintenance shops, either new or converted are usually provided with one or more full length

* Engineer Shops and Equipment, Southern Railway System



Interior of a modern three-level diesel servicing and repair shop

pressed floors and platforms. A drop table is installed, either for single pair of wheels or complete truck with a release track and work area for wheels, motors and trucks. The parts reconditioning room, filter cleaning room, offices and storehouse are usually placed at the end of the stub tracks. It is desirable to have these areas on the platform level, utilizing the area underneath for additional storage, battery overhaul or wash and locker rooms. Such an arrangement has proved very satisfactory as a basic design and a large number of shops have been constructed on this pattern.

An overhead traveling crane is usually provided, spanning one service and the wheel release track and traveling the length of the building or operating crosswise over the drop pit and covering portions of the wheel release and service tracks. If traction motors and wheels represent the heaviest equipment to be handled, a 5-ton crane is adequate. Normally a 7½-ton crane can be installed at slightly greater cost to handle main generators, steam heat generators and other heavy parts into and out of the locomotive. If Diesel engines are to be removed and overhauled a crane of 30-ton capacity, with 5- to 10-ton auxiliary hoist, is essential.

A shop of any appreciable size should be equipped with pipe systems for disbursing both lubricating oil and treated water for engine cooling system direct to the locomotive by hose, eliminating costly barrel handling. The lube oil system should include storage tanks for lube oil, pumps and piping to convenient points on the platform as well as a similar arrangement to remove and return used lube oil from the engine to a dirty lube oil storage tank.

The high cost of water treatment in Diesel engine cooling systems makes it desirable to salvage and reuse the engine cooling water, when necessary to remove it for engine work. Two pipe systems are provided, with pumps and storage tanks, one to distribute the water to suitable locations on the platforms and the other for return of water drained from the cooling system.

The ventilation of the shop building is very important for the removal of fumes. Early Diesel shops were provided with jacks or hoods to remove fumes but it is now general practice to use motor driven exhaust ventilators, with chain or motor operated dampers, for this purpose.

Converted Boiler Shop

There are numerous variations of this arrangement where existing buildings were converted for progressive maintenance work, all of which form efficient arrangements. In one case two inspection pits were installed in a boiler shop, adjacent to a large erecting shop, for four-unit freight locomotives. Instead of depressing the floor the top of the rail on inspection pits was placed 2 ft. 9 in. above floor level, with a grade in the track outside the building. This reduced the cost since it was only neces-

sary to remove the floor for the pits themselves. Platforms were constructed between and outside the tracks with a cross platform at the stub end providing sufficient space on the upper level for parts reconditioning and filter cleaning.

The top of the working platform is at cab floor height and 7 ft. 4 in. above shop floor level. This feature necessitated long ramps, steps and considerable travel time but has not proven to be objectionable.

Converted Erecting Shops

A number of erecting shops on different railroads have been converted for progressive maintenance work by installing new or extending existing inspection pits to provide space for one or more Diesel locomotives in the shop. Floors are generally depressed and working platforms provided at cab floor level. In some cases space is provided on the platforms for parts reconditioning and filter cleaning but usually such work can be handled in the machine shop area, under or on balconies or at some convenient section in the building.

An erecting shop with parallel or transverse tracks in the erecting bay is most satisfactory for such a conversion; however, an efficient arrangement can also be provided in a longitudinal shop.

Converted Enginehouses

It is entirely possible to convert a steam locomotive roundhouse into a progressive maintenance shop for Diesel locomotives and several successful installations have recently been placed in service. In two cases the roundhouses were of reinforced concrete construction, in good condition and no longer required for steam locomotive work. The existing inspection pits were only long enough for one Diesel locomotive unit and too shallow for satisfactory inspection and maintenance, since they varied in depth from 2 ft. 10 in. at one end to 3 ft. 2 in. at the drain.

Conversion work consisted of the construction of a 24-ft. brick and concrete extension on the outside circle of the roundhouse with the inspection pits extended to a total length of 103 ft. The new portion of the pit was 4 ft. 6 in. deep between rails and it was found that the old portion could be deepened by removing the original concrete floor and pouring a new slab to provide a minimum depth of 4 ft. 6 in. in the entire inspection pit. It should be noted that inspection pits in modern Diesel shops are generally constructed with a depth of 4 ft. minimum from the top of rail, with the floor graded for drainage. With a deeper pit, as mentioned above, ledges are usually desirable in side walls above the pit floor to support boards or platforms for working on the upper part of the trucks.

The old floor in the roundhouse was removed and a new depressed floor installed over the entire area of the 24 ft. extension and around the ends of the pits, but it extends over only two-thirds of the original area in the roundhouse to keep costs to a minimum. Working platforms of tongue and groove planking on steel frame and columns were installed over the entire depressed floor.

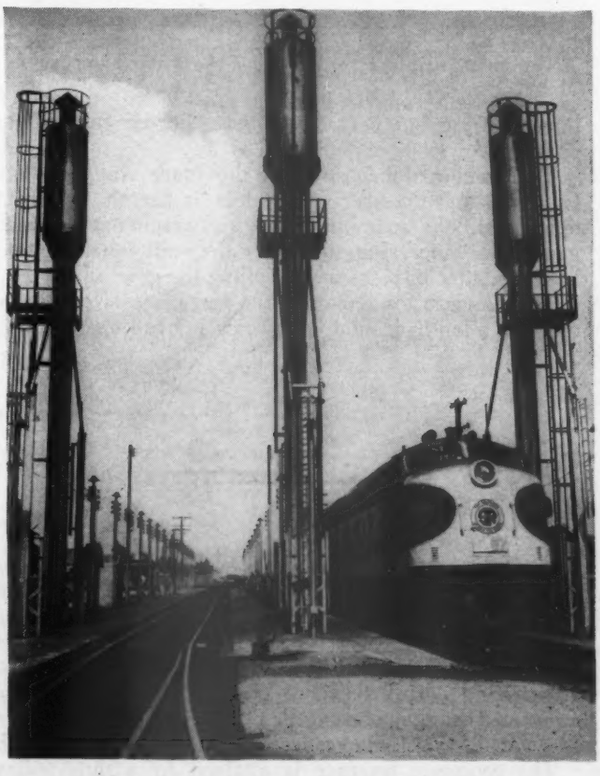
These roundhouses were designed primarily for the maintenance of Diesel-electric freight locomotive units and the platforms extend only 70 ft. along the 103 ft. length of the inspection pit, which is sufficient to reach all three doors in the cabs of an "A" and "B" freight unit backed into the roundhouse. This is not a serious inconvenience and reduces the initial cost as compared to depressed floors and platforms the full length of the inspection pits.

The number of roundhouse stalls to be converted will depend upon the number of locomotive units to be handled. Eight stalls were converted in one roundhouse and six in the other, providing space for two freight units on each track or a total of 16 and 12 units respectively for maintenance work in the shop at one time. As the requirements for Diesel locomotive work increase, with a corresponding decrease in the volume of steam locomotive work, additional stalks can be converted for Diesel repairs.

A drop table for a single pair of wheels is provided at each location serving two or three of the extended inspection pit tracks as well as one or more additional tracks used for wheel release and space for working wheels and motors. The floor at the wheel release track is at top of rail level and the stalls are not extended. Wheels, motors and other heavy parts are handled by a 5 or 10 ton overhead crane in the monitor section of the roundhouse.

The Diesel section of the roundhouse should be separated from the steam section to keep out dust and dirt. One or more stalls with the floor at top of rail level or platform level can also be partitioned off and used for parts reconditioning or filter cleaning work. A more satisfactory arrangement is to construct an addition to the building for this work. It could be in the form of an extension on the outside circle covering two or more stalls.

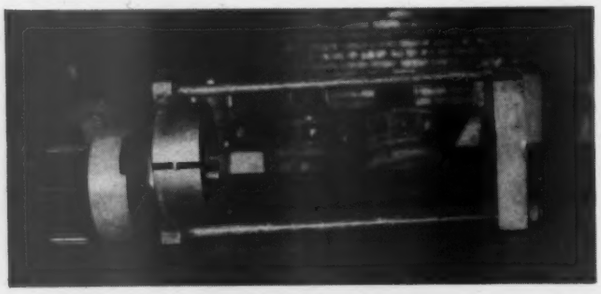
Progressive maintenance facilities in a converted erecting shop, roundhouse or steam locomotive shop can be designed and arranged to perform the work as efficiently as those in a large new repair shop. Cost will be reduced materially and while in some locations it may be necessary to do extra switching or to separate the locomotive into several sections such disadvantages are not serious.



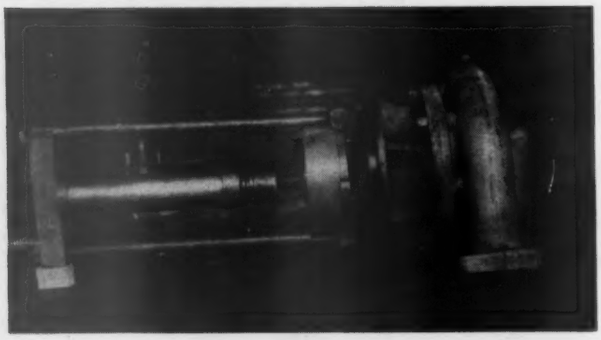
Outside servicing tracks for diesel power

Water Pump Gear Puller

The removal of water pump gears is simplified by a pulling arrangement which consists of a backing up piece, two long rods, an inner and an outer ring. The inner ring is split to permit placing it over the gear, and has an internal flange to contact the gear during the pulling operation.



The principal parts of the water-pump gear puller. The split inner ring held apart, shows its construction by two small pins which are not part of the puller



The puller in place for removing the water pump gear

The combination section of the inner ring, the two long rods and the backing-up block is flexible to permit opening up the split inner ring and placing it over the gear. The outer ring slips over the split inner ring to hold the latter in place while pulling the gear off.

The pressure for removing the gears is exerted by the use of a 5-ton hydraulic jack which is hand operated.

Cylinder Assembly Puller

A device has been developed at the Spencer, N.C., shops of the Southern to simplify the pulling of heads, liners and pistons on E.M.D. locomotives. The main frame of the puller is in two parts hinged together. One part fits over the flange on which the radiator cool air baffle rests. The second part fits over a channel section under the radiator. During operation the puller is L-shaped with the first part of the frame vertical and the second horizontal.

The necessary leverage is attained by a three-pulley system, two on the horizontal section of the frame and one on the line. The pulleys on the frame are so applied that either may be removed easily to get at the No. 3 or 11 cylinder without interference from the shutter air cylinder. The removal is made easy by securing one end of the shaft with a wing nut.

The cylinder assembly puller in operation

* * *

Diesel brake rigging, badly worn from hard service, is repaired by oxyacetylene welding in a western rail road shop. When holes in the many types of levers become worn, they're rebuilt with steel welding rod. New holes are then drilled in the parts to new sleeves. Welding and drilling is done at a fraction of the cost of new parts.

Changes in 1951 Interchange Rules*

BECAUSE of continual changes in car construction, car service, interchange problems, methods of repairs, billing practices, and the ever fluctuating costs of labor and materials, etc., corresponding changes in the Rules and in the prices (charges) for repair materials and labor must be made from time to time as conditions warrant. These are bound to keep you alert and require steady and close attention in order to be up to date. No one person knows it all, each of us is continually learning from each other through associations of this kind, by direct contact and in other ways. Likewise, many of us make suggestions or recommendations for changes in the rules but never get away with them all.

Recommendations for changes in the rules, as you all know, are handled by the Arbitration Committee of the Association of American Railroads, Mechanical Division, the suggestions coming from the various other standing committees, from railroads, private car lines, associations like this one, etc. The prices are revised by the A.A.R., Committee on Labor and Materials by checking semi-annually in Spring and Fall, through quotations obtained from the purchasing agents of ten railroads representative of all sections of our country, including one Canadian road. Seven per cent stores expense, one per cent interest on stock investment and approximately one per cent for commercial and deadhead freight haul are added; see Interpretation No. 1 to Rule 105. These percentages are now being checked by a Joint Sub-Committee.

Labor rates are similarly checked, and to these averages are added percentages to cover overhead expenses, railroad retirement and unemployment insurance taxes and vacations with pay, as described in preface to Rule 107. All price revisions, including reproduction prices for destroyed cars, are also subject to approval by the Arbitration Committee. The private car lines are adequately represented on these committees.

Billing for car repairs is a very important and necessary part of our general subject and is greatly influenced by practically all the rules. If you have no idea as to what this totals for the country, I might state that the last survey by the A.A.R. covered the year 1939, the total for freight car repairs billed by railroads was about $30,853,696, excluding repairs to passenger equipment cars, repairs on defect cards, "No Bill" repairs, destroyed cars, and billing by private car lines. Of that total, $9,761,664, or 32 per cent was repairs to private line cars. The totals today would very considerably exceed these figures due to the large increases in subsequent labor and material prices, over 100 per cent each.

As further information and just to check on how the roads represented in the association treat our Pennsylvania freight cars, and vice versa, regarding repairs charged, allow me to present the following data covering the year 1950 (which figures do not include destroyed or dismantled cars):

We look forward to a reduction in bills against us, since we built several thousand new cars in the last few years, plus 10,000 new Pennsylvania and 10,000 Equitable cars this year, and retired 56,000 of our oldest cars during the last five years, and also have a very large program of heavy repairs and improvements to our other cars.

Now, in taking up the changes made in the rules effective January 1, 1951, I will not discuss to much extent those that were issued in Supplement No. 1 dated July, 1950, as you are well informed on same. Therefore, since important changes have been made they should be carefully studied and the requirements strictly followed. In addition to the Changes from 1950 Rules printed in front of the Rule book, attention is directed particularly to the following:

Rule 3

The effective dates of the following Sections have been extended to January 1, 1952:

Sec. (a-4)—Type AB brakes required on all cars, in interchange. This extension is account Order by Division 3 of the Interstate Commerce Commission issued on

* Abstract of a discussion of the changes in Interchange Rules presented before a meeting of the Eastern Car Foremen's Association, New York, February 9, 1951.

† General foreman, M.C.B. Clearing Housing, Pennsylvnia.

TABLE I—CAR REPAIRS, SELECTED ROADS, YEAR 1950

Road	Repairs to P. R. R. freight cars: Total repairs	Per diem days	Repairs per car day	Repairs made by P. R. R.: Total repairs	Per diem days	Repairs per car day	Foreign roads exceeded repairs made by P. R. R.
B. & O.	$ 312,997	1,310,313	$0.238	$139,958	1,524,619	$0.098	$ 173,039
B. & M.	68,659	307,014	0.224	13,351	160,733	0.083	55,308
C. of N. J.	28,683	259,837	0.111	10,504	66,548	0.158	18,179
C. R. P.	43,320	101,735	0.426	31,419	293,911	0.107	11,901
D. & H.	226,385	395,095	0.573	40,914	458,439	0.089	185,471
D. L. & W.	163,158	469,182	0.348	41,340	496,228	0.083	121,818
Erie	163,027	616,688	0.264	58,048	669,260	0.087	104,979
L. V.	102,839	651,621	0.156	44,091	482,165	0.091	58,748
N. Y. C.	629,438	3,416,895	0.184	294,931	3,017,927	0.097	334,507
N. Y., N. H. & H.	133,997	576,175	0.233	23,634	310,563	0.076	110,363
Reading	252,189	921,947	0.274	101,041	1,044,503	0.097	151,148
Total	$2,124,692	9,026,502	$0.235	$799,231	8,524,896	$0.094	$1,325,461 or 0.141 per car day
Total defect cards	134,544			96,022			
Grand total	$2,259,236			$895,253			

October 10, 1950, which thus eliminates the second note under this Section (a-4) at top of page 17 of the 1950 Rules referring to I.C.C. Docket No. 13528 on this subject.

Sec. (a-6)—Air brake pipe clamps; *J* bolt type.

Sec. (a-7)—Air brake pipe clamps; *U* bolt type.

Sec. (b-7)—Metal badge plates (brake levers).

Sec. (b-9)—Required brake power percentages.

Sec. (c-11)—Old style couplers have 5 by 7 shank.

Sec. (c-12)—*E* type coupler, bottom rotary operated, not equipped with assembled riveted type lock lift lever and toggle.

Sec. (t-3-b)—Cast-steel truck side frames have *I*, *T* or *L* section compression or tension members.

Sec. (t-3-f)—Cast-steel truck side frames to which repair patches or reinforcing plates have been applied.

Sec. (u-4)—Non-acceptance of Class E-3 cars from owners. (New note added states no further extension will be granted.)

Sec. (b-2)—Modified to provide that air brake beams of not less than the capacity of the No. 2 plus beam are required on all cars in interchange.

Sec. (d-1), Third Note—Modified to indicate that requirement of this Note applies to other cars of special construction as well as to ore cars, and only to such cars built new or rebuilt on or after January 1, 1950.

Sec. (d-3), Note—Modified to clarify the intent that draft keys should *preferably* be applied from the brake pipe side of the center sills where *construction of car* will permit.

New Sec. (j-3)—Added to provide that empty cars with repack date more than 15 months old may be rejected from owners. See comments under Rule 66 relative to change in time limit for periodic repacking of journal boxes. Rule 66-a reduces the time limit for periodic repacking of friction journal boxes from 15 months to 12 months in an effort to improve lubrication performances of freight cars.

Sec. (r)—The complete "Specifications for Running Boards Other Than Wood, for Box Cars, Other Roofed Cars, and Tank Cars; for Brake Steps in Switching Service Including Their Tenders, auxiliary Power Units, or Ferry Idlers, If Any," following Paragraph (r-7) have been eliminated inasmuch as same are shown in Sec. C of the A.A.R. Manual of Standard and Recommended Practice. Reference to the latter was added to Paragraph (r-7).

Rule 4

Sec. (a) & (k)—A number of cases have been reported to the A.A.R. Secretary, of unnecessary delays to extensively damaged cars moving homeward for repairs, because defect cards attached fail to carry notation "Home for Repairs." Such cars are shopped by the road receiving same in interchange for checking to ascertain if all damage is fully covered by the defect cards. Invariably, additional unconcealed associated damage is found to exist, and the car is delayed while steps are being taken to procure additional defect card. In all cases of extensively damaged foreign cars being sent home on own wheels or loaded up, it is advisable to add this notation on the defect card issued, and also show date built, lightweight and Rule 112 class of car, in order to check that repairs billed do not exceed depreciated value less salvage.

Rule 9

A.A.R. couplers or parts thereof, R&R—Note modified to provide that when type *E*=11-in. face knuckle is applied separately, type of coupler repaired need not be shown. All other requirements are continued.

Journal boxes, friction bearings, periodic repacking, etc.—Modified to provide that purpose for which car was shopped must be shown if car is repacked prior to expiration of 12 instead of 15 months. This is due to change in Rule 66.

Brake Beams, R&R—New requirement effective August 1, 1950 to show "A.A.R. No. 18 and Certificate of Approval No. ," both of which are cast or marked on strut, of such beams—see Identification Table (Figure 2) under Rule 101 on page 213.

Brake Shoe Keys, applied—Requirement to show symbol *K-34* or *K-40* for A.A.R. Standard or Alternate Standard keys is eliminated, the repair card need only show *One (or more) brake shoe key* and the *Reason* for renewal.

Air Brakes Cleaned—Type AB-1 air brakes added, used mostly on head end passenger equipment cars but same cleaning period applies as under Freight Rule 60. Care must be taken to distinguish between types AB and AB-1-B brakes inasmuch as charge for COT&S, the latter is about 50 per cent higher than for AB brakes.

Rule 17

Sec. (e), Note 9—Modified to provide that where hanger type brake beams are substituted for hangerless type due to handling line responsibility, defect card should be issue for labor and material.

Sec. (L)—Modified to provide that extra heavy pipe (as well as fittings) may be substituted for single weight, or vice versa, as correct repairs; also, this provision now applies to hand rails on tank cars; material charges in all cases to be based on type of pipe or pipe fittings applied.

Sec. (s)—Modified to prohibit the substitution of A.A.R. Standard helical truck springs for long travel springs, or vice versa. Defect card for labor and material should be issued for improper substitution.

Rule 20

Figs. 2 & 3—Modified by eliminating requirement "where welding or riveting facilities are not available." Carrier iron shims covered by these figures may be applied without such restrictions.

Rule 23

Sec. B, New Item, Check Plates, Farlow—Added to prohibit welding same when section is broken out between key slots.

Item Coupler Locks—Modified to limit reclamation by welding to the building up of the depression where the lock has been worn by contact with the knuckle tail, and to eliminate permission to weld fractures in lock legs.

Item Journal Boxes (not integral)—Modified by dividing same into three sections, i.e., "Cast Steel—no restrictions"; "Malleable Iron—Bronze welding worn surfaces only" and "Cast Iron—no welding permitted."

Item Reservoirs, Auxiliary and Emergency Air Brake, Cast-Iron—Modified to provide for building up worn holes in lugs and bronze welding of lugs where fractured or broken off beyond ½-in. from body. No welding of body portion permitted.

Item Tanks of Tank Cars—Modified to permit welding of cracks or fractures in tanks of welded construction if all applicable requirements of I.C.C. Regulations for Transportation of Explosives and Other Dangerous Articles, and A.A.R. Specifications for Tank Cars, are fully complied with before such cars are restored to service.

Rule 30

Sec. B-1 table—Modified by making a separate item of *All-steel flat cars* and extending the subsequent reweighing period of same from 30 to 48 months. This is in accordance with revised Car Service Rule 11 approved by letter ballot of the Operating-Transportation Division and announced in Circular No. T-195, dated November 9, 1950.

Rule 32

Sec. 9—Modified to clarify the intent that *any type* of follower missing with draft gear in interchange, is delivering company responsibility.

Sec. (12-b)—Modified by eliminating the requirement that car owner must hold contaminated cars to give road responsible an opportunity to inspect same. Joint Inspection Certificate should be executed promptly. This change is for expediting repairs account all cars badly needed for service at the present time.

New Note 1—Added as follows: Cars carded for contaminating commodities should preferably be confined to cars suitable only for rough freight loading.

In some cases the loading line has been obliged to issue defect cards covering renewal of complete floors and lining on foreign cars loaded with contaminating commodities. This is a costly proposition and the selection of cars for such commodities must be carefully policed at all times.

New Note 2—Added to provide that where contamination can be eliminated by washing, steaming, sanding or other methods of cleaning, this should be done rather than renewing parts of car contaminated.

Interpretation No. 3—Modified to clarify the intent that external damage caused by clam shells, etc., must be to the extent specified in Rule 4 before it is considered cardable in interchange. Interior damage similarly caused should be assumed by the road on which it occurred.

Rule 57

First Paragraph and Drawing—Modified to clarify the location of the air hose clamping lugs and also to provide relocation of the coupling to the hose, so the date on the hose label will be in a better position to be identified when applied to car.

Rule 60

Sec. (f)—More cars must be exercised in removing all old air brake cleaning marks, by *scraping off* before painting over with quick-drying paint, preferably black; also in recording the old markings. A number of shops have even failed to apply new stenciling. Failure to do so results in claims for refunds under Sec. (h), as well as when retaining valve or dirt collector is not cleaned. The same care is also necessary for same reason in the recording and removal of old stencil markings for repacking of journal boxes, and application of the new stenciling.

Sec. (L), Note 6—Modified to describe method of identifying new style service portion back cover by its eight reinforcing ribs, versus only one rib on the old style cover. It also is thicker and has a reinforcing or raised bead all around its outside edge, while the old style cover has no such bead. In cases where service portion removed has new design back cover, it should be replaced in kind. The charge for COT&S has been increased 16 per cent.

Sec. (L) New Note 7—Added as follows: When AB brakes are given periodic attention, old style ball check cover of emergency portion must be replaced with new style cover (Pc. No. 95051 or C V-101). The new style cover can be identified by flange added for retaining its gasket, both covers having same piece number.

Rule 61

Sec. (a)—Modified to provide that slack adjusters, on cars so equipped, shall be inspected and repaired when necessary when car is given periodic repairs to air brakes or when car is on repair track for other work.

Sec. (c)—Modified by omitting requirement to lubricate side bearings when car is on repair track and is jacked for repairs. Lubricating center plates remains a requirement in such cases for which the charge remains the same 12 cents per car end per Item 172 of Rule 101.

Rule 66

Sec. (a), (f) and (g) and Interpretation No. 2—Modified by reducing time limits as follows for periodic repacking of journal boxes on empty or loaded cars, so as to improve lubrication performance of freight cars:

(*a*)—15 months reduced to 12 months
—14 months reduced to 11 months
(If on repair track for other work)

(*f*)—14 months reduced to 11 months
(If on repair track for other work)

(*g-1*)—15 months reduced to 12 months
14 months reduced to 11 months
(If on repair track for other work)

(*g-2*)—9 to 14 months reduced to 9 to 11 months—
Wheel changes, etc.

(Continued on page 68)

* * *

New roof sheets are positioned by turn-buckles and held for welding by wedges

Coaches Rebuilt for Modern Appearance

The roof sheets are skip-welded to the carlines on the under side, and completely cover the old roof structure

A WHEEL-to-roof face-lifting has been given at the Aurora Shops of the Burlington to a series of old-style coaches formerly used in regular passenger service but now assigned to suburban service. These reconditioned cars have auxiliary generators in one end that develop current for lighting and air-conditioning. The roofs of the old cars are hidden under new streamlined sheathing, new larger windows with aluminum frames are installed, interiors are completely modernized, and the rebuilt air-conditioned cars roll on six-wheel trucks with roller bearings.

The most elaborate alterations to the original structure of the old cars are in the roof and window frames. A new turtle-back roof is built right over the old-style double-deck roof on carlines made of angle iron 1½ in. by 1½ in. by ¼ in. These carlines are oxyacetylene flame-formed on a simple jig. The carlines are welded to the longitudinal members of the old roof and to the tops of the car sides.

Following the installation of the new carlines, roof sheets of ⅛-in. mild steel are positioned and forced into place by straps that are pulled tight by turn-buckles. Wedges are also used to force the sheets down to the carlines. The sheets are skip-welded to the carlines from underneath covering completely the old roof construction with the new roof sheets.

Once the sheets are securely held by the inside welds, butt welds are made in the sheets on the roof by means of Heliarc welding. Spacing between sheets is about ⅛ in. and the welding, using an alloy filler rod, is done at about 10 in. per min. This welding is performed by one or two operators and each seam is started in the middle with welding progressing toward the sides. Current is 110 amp. d.c. with an argon flow of 5 liters per minute. Heliarc welding permits the operator to get good penetration to the carlines and a dense, uniform deposit of weld metal with no spatter. The weld is built-up about 1/16 in. high. Only a minimum of grinding is done on the welds about 3 ft. up on each side of the roof. The top portion of the roof is painted as welded.

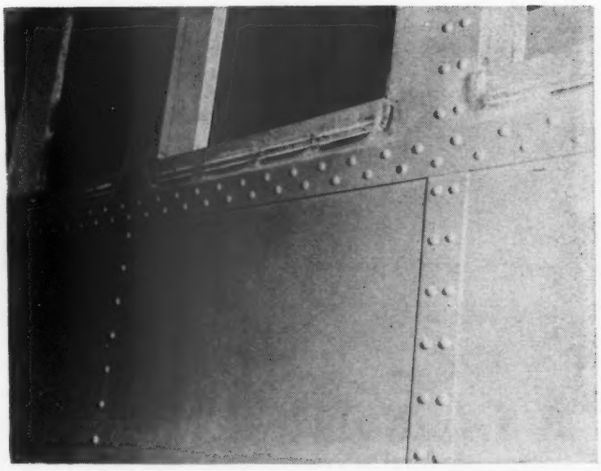
More than 360 ft. of Heliarc welding is done on each car to join the 28 roof sheets, but no expansion problems are encountered. The exhaust hatch is also welded in by the Heliarc process.

To make the new aluminum window frames fit the old openings, it was necessary to weld in steel sheet filler sections at the top and bottom. One illustration shows the angled section of ⅛-in. sheet being fitted to the bottom of the opening. This section as well as one at the top of the frame is Heliarc welded to the existing side sheets. The welded area at the bottom of a window is shown prior to light grinding. When finished, the joint is practically invisible. These horizontal welds are 34 in. long at the bottom and 28 in. at the top. The same welding data applies to these welds as to the roof welding.

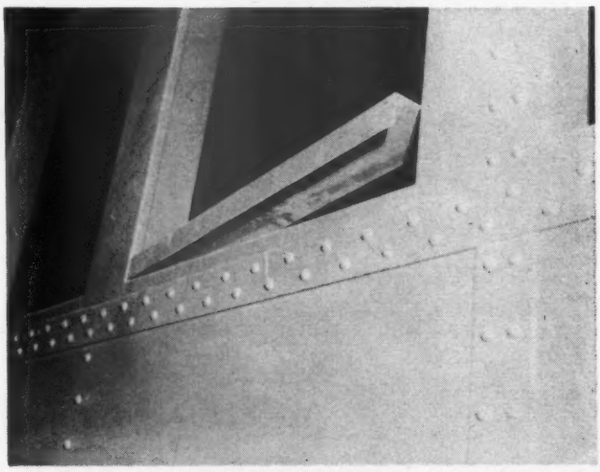
To reduce spatter problems, Heliarc welding is also used at each end where the roof sheets overhang the ends and in the welding of the four door drip moldings to the roof sheets.

Welds made with a Heliarc torch usually require no cleaning or grinding. In using this method on car areas where finish grinding is costly, the Burlington has taken a page from the automobile business. In automobile plants Heliarc welding is widely used on thin-gauge mild steel to make welds in body parts on the assembly lines.

Photos are through the courtesy of Oxweld Railroad Service Division Union, Carbide & Carbon Corp.

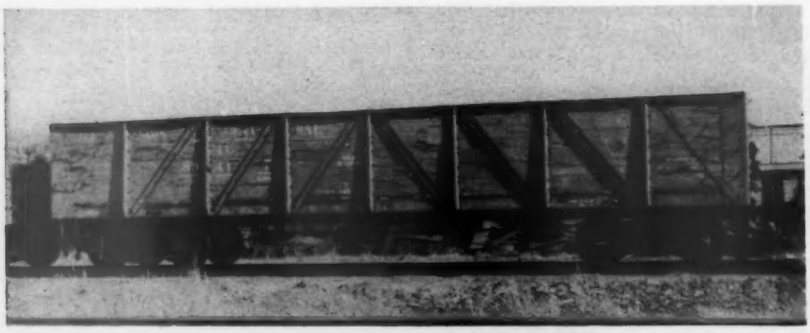


Weld between the added fill-in section and the side sheet prior to grinding. When finished, the joint is practically invisible



The angled section being placed on the lower edge of one of the window openings to be Heliarc welded to the original side sheet

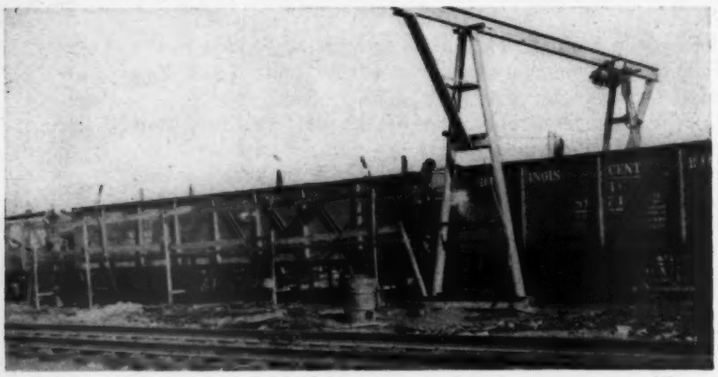
Heliarc welded roof of finished auxiliary power car ready for service



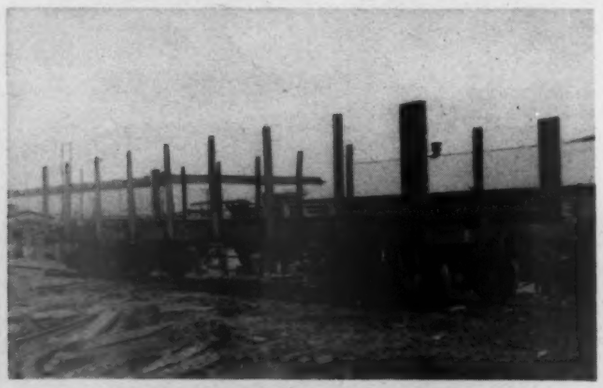
Left: A typical Illinois Central solid-bottom composite gondola car with high sides

Below: The first step in repairing the composite cars is burning out the rivets. This view is from the yard side of the dismantling track. The shop side has similar scaffolding and, in addition, a steel netting to protect personnel

Gondola Car Rebuilding Program



The scaffolding used for burning out the end rivets and top rivets after the wooden sides have been removed



The car is stipped to the underframe with the exception of the side stakes

The Centralia, Ill., shop of the Illinois Central is engaged in a program of repairing 750 solid-bottom gondola cars in which high sides are replaced with low sides. The principal lading for the low side cars will be sand, gravel, coal and agricultural limestone. Because of the nature of the lading, the low-side car will not be reduced in capacity on a weight basis, although the unloading of the cars will be considerably simplified because of the lower sides of the cars.

The cars will retain the present principal dimensions with the exception of the lower sides, which will reduce the inside height to 3 ft. 5¼ in. This will permit the contents to be shoveled out more easily. The new capacity is 1,350 cu. ft.

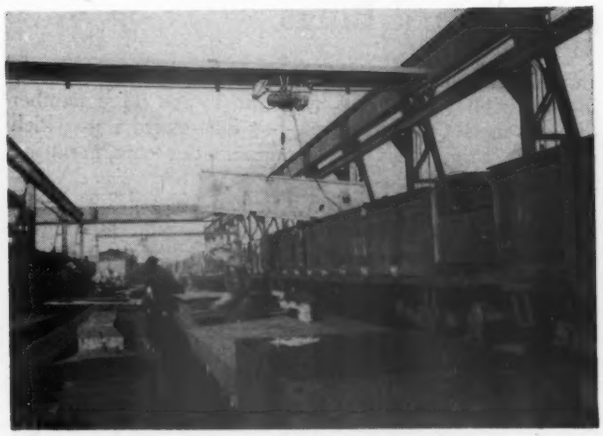
Repair Procedure

The repair procedure begins with stripping the outside of the car and burning out the rivets, removing the floors, sides and the steel ends. The side and end stakes are left in place unless renewal is necessary. The existing end and side top rails are removed to the shop for straightening. The stakes are burned off at the top to the new side height, after which the existing top rails are reapplied.

New ends were fabricated for the cars. The end top angles and the side angles are replaced on the new ends and hides. The holes in the new sides are burned and reamed after the side has been put in place and temporarily secured. Pre-drilling was not considered practicable because the cars were no longer in perfect alignment.

The trucks are completely reconditioned, but the underframes are not touched. The only air brake work required is periodic cleaning. The existing threaded train line piping was used in all cases as it was found to be

The fast and easy way to remove the existing wood flooring. The air jack in the center raises the car on one side as shown. Steel bars are placed under the floor boards, and, as the air is released from the jack, the weight of the car pushes the nails and the floor boards free. The boards can then be thrown clear of the car by hand



Above (right): An outdoor overhead traveling crane is used to hang the side sheets. After the sheets are temporarily secured in place, the rivet holes are burned and reamed

in good condition.

The ¼-in. sheets for the sides and ends are brought to size. Two long and one short sheet are used on each side, the short sheet being 9 ft. 10 in. long and the long sheet 14 ft. 6⅛ in. long. Each end is reinforced by two old side stakes or 5 in. by 3½ in by ½ in. angles from retired cars. These reinforcements run horizontally across the inside of the end. When stakes are sold they are riveted in place; where angles are used the flanges are turned toward the end sheet and welded threto, forming a triangular box section. The sides are reinforced by three inside brace gussets on each side. These are riveted to the sides and to the cross-bearers.

The floor is nailed to four oak nailing stringers with a cross section 4 in. by 6 in. All underframes are coated with an asphalt base car cement.

Interior of the car with the side sheet temporarily bolted in place for burning and reaming the rivet holes

An offset is put in the side sheets at the top and the bottom edges by the roller shown above

Left: Interior of a low-side car showing the end and side reinforcements. Below: The car ready for service

Dust Guard Plugs

In a circular letter dated January 29, the A.A.R. Mechanical Division again called attention to the large number of plugs missing from journal-box dust-guard slots which results in rain, snow, and foreign matter contaminating the packing in the box.

The importance of maintaining satisfactory dust guard conditions and replacing plugs when found missing is generally recognized but sometimes overlooked. In this connection, the circular makes the following comments about conditions which are general over the country:

"A plain wooden dust-guard plug does not adequately seal against water unless it is individually fitted; and even when made close fitting, it has insufficient holding power, due to continual swelling and shrinking, to remain in place for any length of time. There are on the market metal clips for holding wooden dust guards in position which improve the holding properties; and wooden guards may be sealed with a plastic material which makes them more efficient.

"When metal covers are used, it is important that they be properly applied by forming them to fit the journal box, after which the ends should be bent down and covers tightened in place. When metal covers are found loose in service they should be tightened by suitable means.

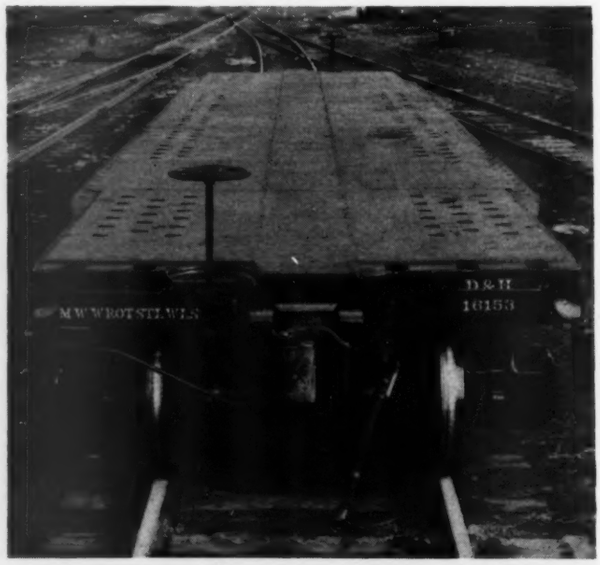
"The practice of sealing dust guard plugs with plastic material is proving successful in service, and this method of application is recommended. The three accompanying illustrations show sealed dust guard plugs, cut away at the center for better viewing a wood plug, metal plug, and a fibrous, or felt-type plug.

"When wheels are changed it is essential that dust guard plugs be properly re-applied. Dust guard plugs can also be given attention when cars are on repair tracks, or at the time of periodic re-packing, and this should be arranged for, as it will be helpful in reducing hot boxes."

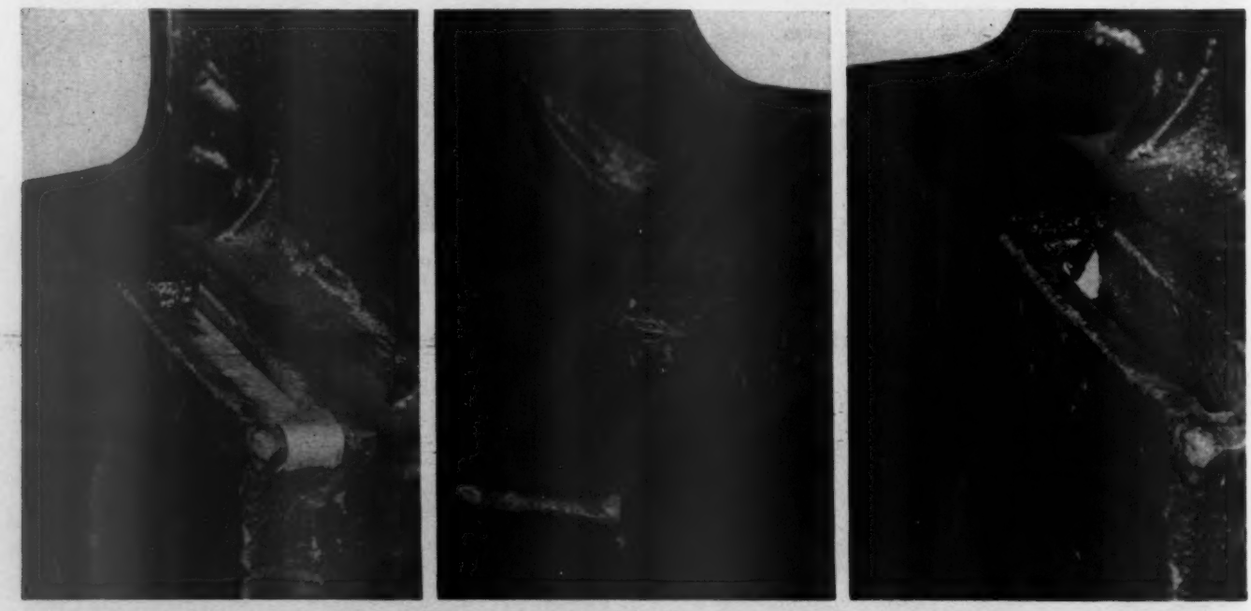
The circular letter closes with a request that appropriate instructions be issued to repair forces on individual roads to make sure that this important subject is followed up.

A Flat Car with 500,000 Lb. Capacity

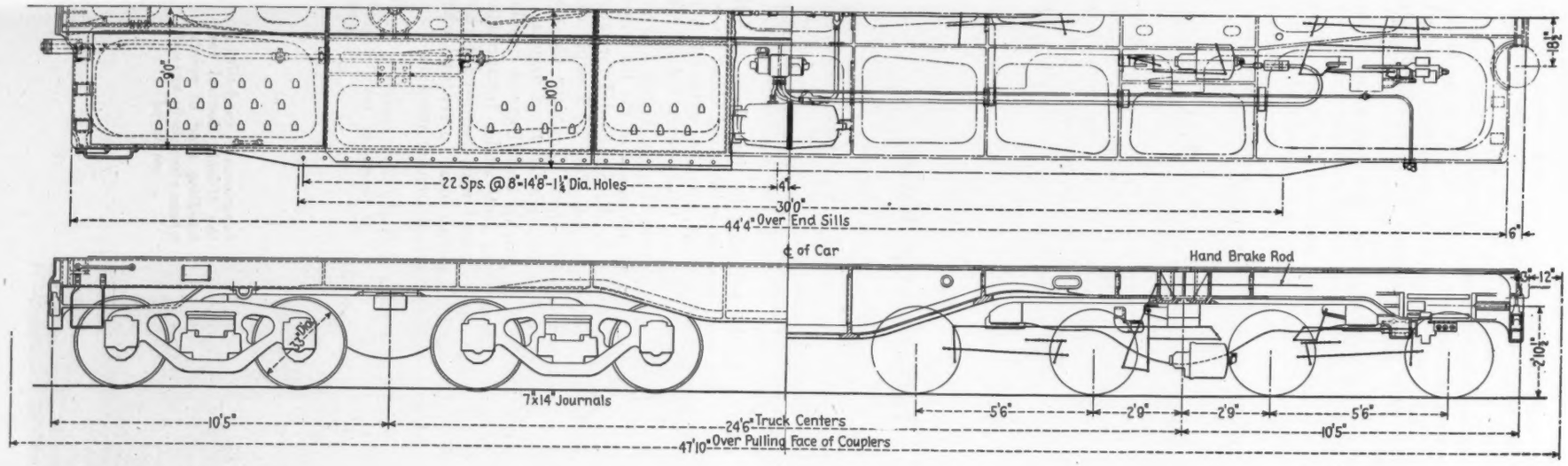
A flat car, No. 16135, designed to handle single loads weighing upwards of 400,000 lb., has recently been assembled at the shops of the Delaware & Hudson at Oneonta, N. Y. The body comprises a one-piece cast-steel frame of low-carbon nickel-steel with a ½-in. Cor-Ten steel floor secured to the top of the casting by a continuous weld. Through the top floor plate slots and holes are provided for securing the loads. Slots are designed for the use of T-head bolts. The holes are 1¼ in. in diameter and are arranged in a row along each side of the floor.



In the top of the flat car are T-slots and tie-down bolt holes



Left: Application of steel strip dust-guard plug sealed with plastic compound. Center: Felt dust-guard plug sealed with plastic compound; Right: Application of wood dust-guard plug sealed with plastic compound



Cast-steel flat car for single loads up to 250 tons

The length of the frame over striking plates is 45 ft. 4 in. The width of the car for 30 ft. at the center is 10 ft. and for 4 ft. 2 in. at each end, 9 ft., with 3-ft. taper connections between the two widths. The height from rail to top of floor is 4 ft. ½ in. The underframe with floor plates intact was supplied by the General Steel Castings Corporation.

The trucks comprise two eight-wheel assemblies. The two trucks under each end are connected with span bolsters. The wheel base of the trucks is 5 ft. 6 in. and the span bolsters between truck centers are 11 ft. long. The four axles at each end are thus equally spaced. The span-bolster center plates are spaced 24 ft. 6 in. The side frames, truck bolsters, and span bolsters are of cast steel. The multiple-wear wrought-steel wheels are 33in. diameter and the journals 7 in. by 14 in. Each nest of bolster spring has five double coils with 1⅝-in. travel and two Simplex snubbers.

There are two 12-in. AB air-brake equipments. The reservoirs and brake valves are mounted under the middle of the car floor and each equipment operates the brakes on the trucks at one end of the car. Westinghouse automatic slack adjusters and Equipco high-powered A. A. R. certified brakes with drop shafts are installed at each end.

The draft gears are Miner A=22XL. The American Steel Foundries couplers have 6¼-in. by 8-in. swivel shanks. Other equipment on the car includes Imperial rotary release rigging, Magnus bearings, National Malleable journal-box lids, Jenkins leather fiber dust guards with Cenco dust-guard retainers, Davis No. 18 brake beams, Schaefer loop-type brake hangers, Illinois Railway Equipment brake-hanger retainers and keys, and Chicago Railway Equipment single-type brake-beam safety guards.

The car, which has a light weight of 99,700 lb. and a load limit of 500,300 lb., is almost identical to one built simultaneously for the New York Central by Merchants Despatch at East Rochester, N. Y. The principal difference is the hand-brake equipment. The N. Y. C. car has a hand brake at one end only; is 1,000 lb. lighter and, therefore, has a load limit 1,000 lb. higher.

Experimental Sand Handling Car

The Illinois Central has built an experimental flat car on which is mounted portable sand conveying equipment for handling locomotive sand at points on the system where clam shells are not employed. The car has the necessary brackets for securing, and a hoist for loading and unloading the two-piece sand conveying arrangement, which was manufactured by the Centralia Engineering and Machine Corporation.

The car is moved to various terminals as it is needed. The tie-down arrangement on the car which holds the conveyor equipment in place is permanently mounted for transit, as is the hand winch for unloading the two sections.

When this car arrives at the point where sand is to be unloaded, the two pieces of the conveyor are set on the ground with the hand winch. The rear section in the illustration is placed under the opening of the car of sand to be unloaded. The long section is depressed on its loading end to fit under a trough on the first section, raising the unloaded sand for delivery to the sand bin.

Both sections are mounted on rubber-tired automobile wheels for easy movement. Both are also balanced about the wheels to facilitate easy handling by hand after unloading by the winch. These two features have resulted in overall easy handling from the flat car to the final sand delivery position, and vice versa, for the 1½-ton long section and for the small section which weighs just under a ton.

1951 Interchange Rules

(Continued from page 61)

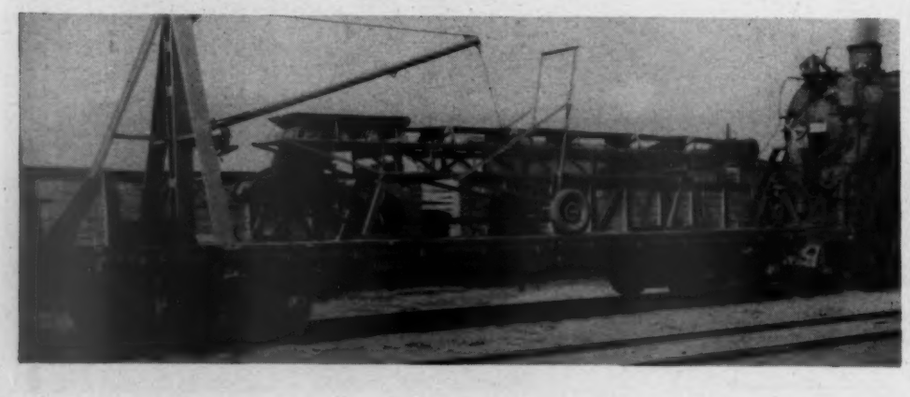
(g-3)—4 to 9 months reduced to 4 to 9 months—Wheel changes, etc.

Interp. No. 2—14 months reduced to 11 months—Bad stenciling

In addition to the reduction in time limits, A.A.R. charges for this work have been increased about 28 per cent effective January 1, 1951. Care *must* be taken in thoroughly cleaning the journal boxes inside "of all dirt, sand, scale, grit, water, or other foreign matter, and the front of the box as well as the inside of the lid wiped clean" as required by the A.A.R. Standard Lubrication Manual. Furthermore, under new Rule 3-j-3 empty cars having repacking date more than 15 months old may be effective January 1, 1951, rejected from owners.

Sec. (c)—Modified to provide that if car is stenciled with solid white square per Note under Interpretation No. 4 indicating it is equipped with approved packing retainer devices, such stenciling must be renewed when journal boxes are given periodic repack attention.

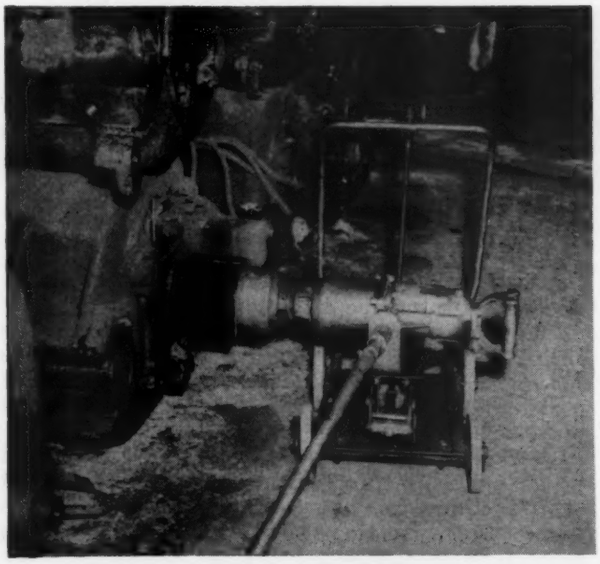
(To be continued in the May issue)



Experimental car built by the Illinois Central for handling sand at points where clam shells are not employed

ELECTRICAL SECTION

Traction Motor Overhaul



Methods developed in shops of New York Subways afford some hints to diesel traction motors maintainers

*By Michael Axler**

WHEN TRACTION motors, used on New York City subway cars, require periodic overhaul, the cars are brought into the Board of Transportation car shops. The car body is lifted with a 45-ton crane, the trucks rolled out, and the car bodies set down on rigid supports. The trucks are picked up with a 25-ton crane and transported

* New York City Board of Transportaion, I.R.T. Division.

Fig. 1 (above)—An impact wrench mounted on a dolly is used for releasing the pinion nut

General view of motor shop

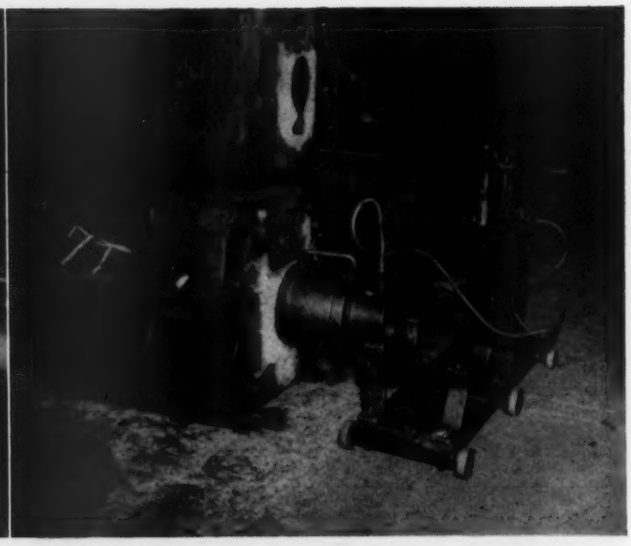


Fig. 2 (left)—Hydraulic puller for removing pinions.—Fig. 3 (right)—The puller as applied to a motor pinion

to the truck shop. The motors are lifted out of the trucks with an electric hoist and placed on a dolly. A monorail crane is used to lift the motor from the dolly and transfer it to the motor shop. The monorail crane runs on the lower flanges of a 15-in. I-beam, suspended from the shop ceiling.

The first overhaul operation is the removal of the pinion nut. This is done with a No. 375 Chicago Pneumatic impact wrench mounted on a dolly (Fig. 1). The wrench is mounted on the dolly on a pantograph jack which permits adjustment to the varying heights of the different motor pinions. The jack may also be rotated through 360 deg. so that it is not necessary to line the dolly with the motor shaft.

When the wrench socket is applied to the nut, the wrench trigger is pressed and the nut is released instantly. It is unnecessary to block the pinion, the inertia of the armature providing sufficient reaction.

Before the impact wrench was adopted, it was necessary to block the pinion with a special holder and remove the pinion nut with a box wrench, having an 8-ft. handle. One man would hold the wrench on the nut, and another would stand on the end of the wrench handle.

Fig. 6—Lathe used for turning commutator and shaft

The pinion is keyed on a tapered shaft. When it is applied, it is heated to a temperature of 213 deg. F. to 238 deg. F. in hot oil and then is driven onto the shaft taper with a 20-lb. hammer to insure a good shrink fit when it cools to atmospheric temperature.

The former method of removal required the use of wedges on each side between the back of the pinion and the bearing housing. The wedges were driven in while the heat from a gas ring of 1-in. pipe was applied to the pinion for a 20- to 40-minute period.

The present method of removal employs the puller shown in Figs. 2 and 3. The toothed section of the open end of the puller matches the pinion teeth so that it may be slid over the pinion. After it is slid beyond the pinion, it is turned so that the teeth on the puller are back of, and in line with, the pinion teeth.

The opposite end of the puller is equipped with a hydraulic jack which engages with the end of the armature shaft. When pressure is applied by the hand pump on the puller dolly, pressure is applied respectively to the shaft and the back of the pinion teeth, and the pinion comes off. As may be seen in Fig. 2, the pinion drops into a cradle and does not fall on the floor. The operation requires from two to three minutes.

After the pinion is removed, the motor is transferred by means of a monorail crane to the special machine shown in Figs. 4 and 5. At one end of the machine is a long fixed center for the commutator end of the armature, and at the other end of the machine is an adjustable center for the pinion end of the motor. The carriage which supports the motor frame is adjustable for height and lateral and may be moved longitudinally along the track on the base of the machine.

The centers have diameters which are smaller than the armature shaft and the fixed center is long enough to extend through the motor frame or housing.

To remove an armature from a frame, the frame is placed on the carriage of the machine and its height adjusted to match the machine centers with those of the armature shaft. The centers are then placed in the armature and tightened.

The housing bolts are removed with a No. 365 Chicago

Fig. 4 (left)—End housing cap screws are removed with an impact wrench. Fig. 5 (right)—Machine for removing armature from motor frame. Hydraulic jack at right is being used to remove end housing by applying pressure on center and pulling housing with two wire cables.

Pneumatic impact wrench as shown in Fig. 4, and eye bolts are screwed into two holes on opposite sides of the end frame. Two lengths of steel cable are attached to these eye bolts screwed into two holes on opposite sides of the end frame. Two lengths of steel cable are attached to these eye bolts by means of a clevis connector and the opposite ends of the cables are attached to a hydraulic jack which bears against the end of the long center. The cable attachment is a threaded rod, and the nuts on these rods are first tightened to take the slack out of the cables, as shown in Fig. 5. Then, when pressure is applied to the long center by means of the jack, the cables release the end housing of the motors. Two of the end-frame cap screws are not removed completely, but are backed out leaving enough threads to hold the end housing after it is released. This makes it possible to handle the motor frame and end housing as a unit after the armature is removed.

The pinion end housing is removed in a similar manner. The cables are attached to the motor frame by eye bolts which pass through the cap screw holes in the commutator end housing and screw into the holes in the motor frame. The cap screws which hold the pinion-end housing are removed with the impact wrench, and when pressure is applied by the jack through the long center and the motor shaft to the pinion-end housing, the motor frame moves with the carriage and the housing comes off.

The carriage of the machine is then moved along over the long fixed center, exposing the armature. The monorail hoist is used to pick up the armature with a canvas belt sling.

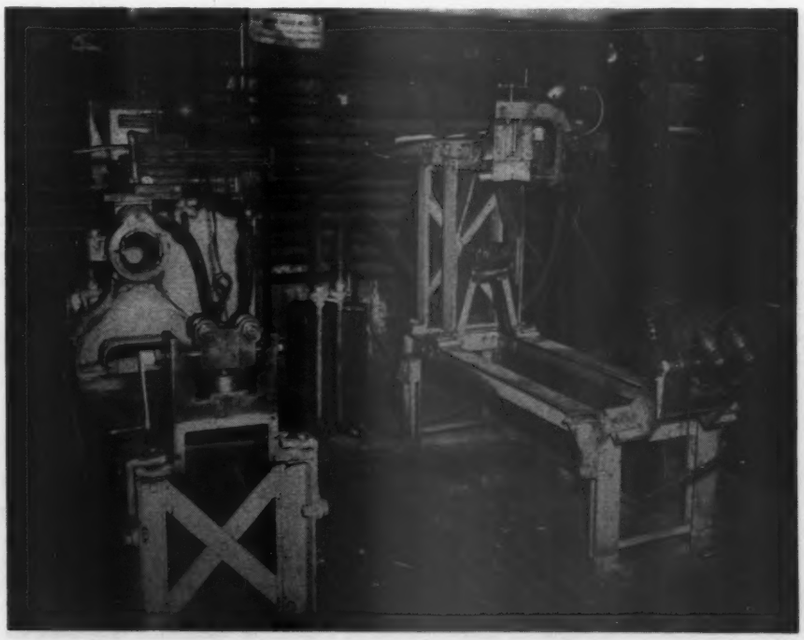


Fig. 7—Undercutters, rear heads drop to place armatures and are adjustable vertically and laterally for lining commutator slots parallel with the armature shaft

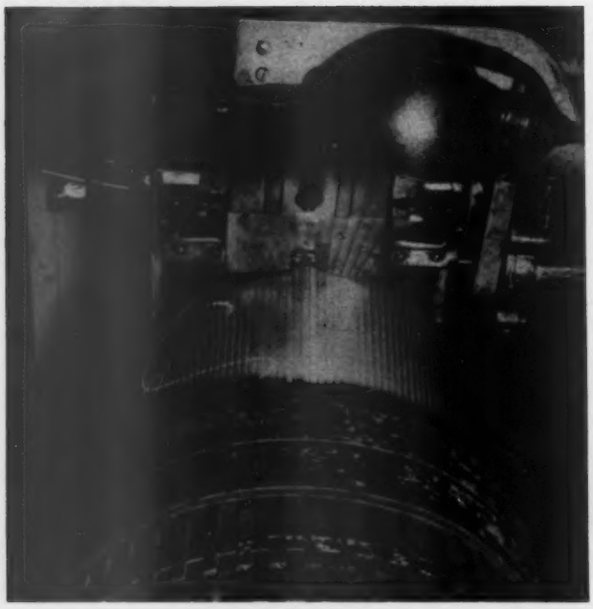


Fig. 8—Close-up of a commutator with the undercutter in position for starting a cut.

The armature is transferred to a cleaning cabinet where it is blown out with compressed air at 100 lb. pressure. The armature is inspected and tested and if it is good, the commutator is turned and polished if its condition requires such refinishing. The mica dust and copper shavings are exhausted from the lathe by a special attachment shown in Fig. 6. Commutator mica is undercut by means of two machines shown in Fig. 7. It will be noted that the rear carriages may be dropped down to facilitate placing of the armature as is shown on the machine at the right. Testing and banding are done on the machine shown in Fig. 8.

When required, armature shafts are turned and polished, also on the lathe shown in Fig. 6. All the motor bearings are sleeve bearings, and a turned motor shaft, of course, requires a bearing to fit. Bearings are bored and fitted by means of the equipment shown in Fig. 9. The bearing is removed from the motor end housing and a new bearing applied by the press at the left. The end housing is then bolted into the circular plate in the positioner in the foreground. The plate is a jig which fits into the vertical boring mill at the rear. The bearing is bored to fit the shaft with which it is to be used.

Overhauled armatures are dipped in air-drying varnish and baked overnight at 250 to 275 deg. F. When motors are assembled, the proceeding described is reversed. After assembly is complete, the motor is tested, and given a running test after which it is ready for service.

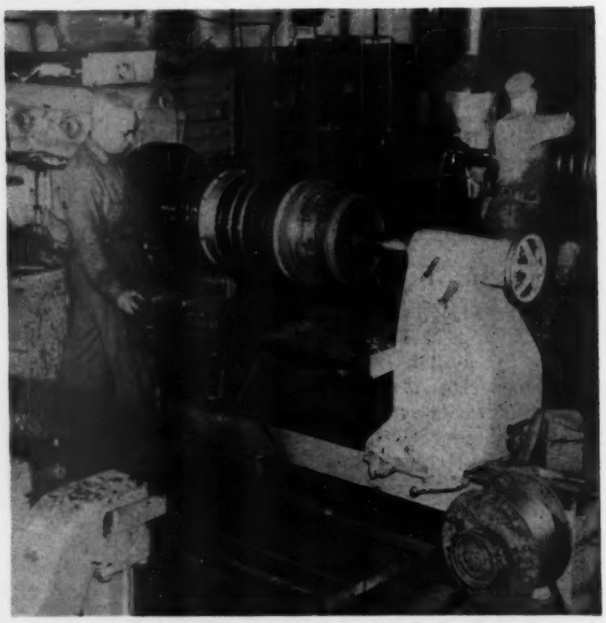


Fig. 9 (above)—Banding machine

Fig. 10 (left)—At the left is the bearing press. In front are two positioners holding jigs which hold end frames when bearings are bored in the vertical boring mill at the back

Parallel Operation of Undercar Power Plants

Control system provides for automatic paralleling of generators without synchronizing equipment and shows a reliability much better than that for cars which are not paralleled

*By G. W. Weber**

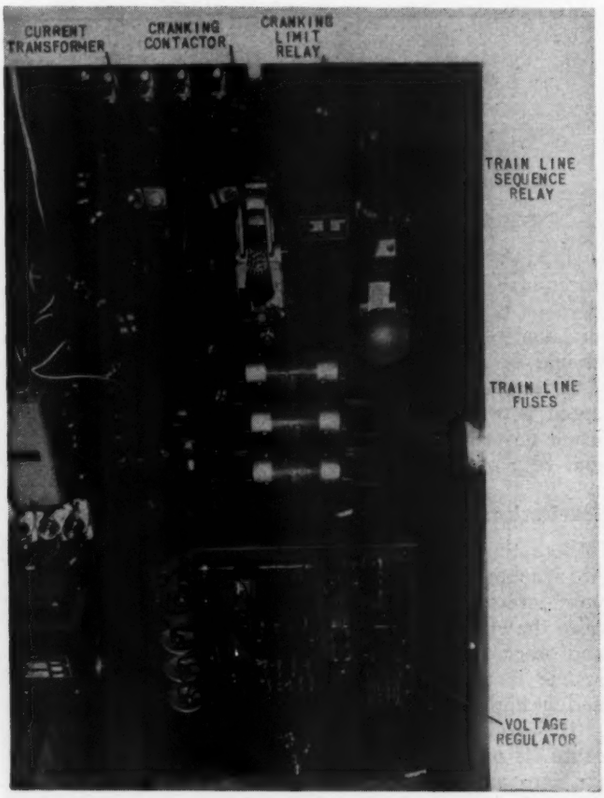


Fig. 1—Individual car control panel

FOURTEEN of the new diesel-driven undercar power plants, developed by the General Electric Company for passenger car power supply, have been operating successfully on the "More Power to America Special" since this train started its tour of the United States in the spring of 1950. This train, frequently called a "showcase on wheels," consists of a two-unit 4,500-hp. Alco-G.E. diesel-electric passenger locomotive, ten display cars, a baggage-dormitory car and three Pullmans.

Each display car is equipped with one undercar power plant, and four additional plants are mounted in the baggage-dormitory car. The fourteen 30-kw. alternators are automatically paralleled on a trainline bus when the trainline couplers are made up, thus constituting the first completely automatic parallel train system to be operated in regular service. They provide over 400 kw. for lighting, air conditioning, space heating, and the heavy electrical exhibit load.

Power plant installations on the display cars are identical to that proposed for railway passenger cars. Present plans call for putting these ten cars into regular passenger service when the exhibit tour is completed.

An excellent demonstration of the operation of the system has been arranged in the meters and instruments display car. Grouped on an exhibit panel are: wattmeters, voltmeters, ammeters, synchroscopes, temperature gages, and pressure gages which have been connected to the plant beneath this car. The effects of starting and stopping the plant, paralleling it with the train line, starting the air-conditioning compressor, etc., can be observed by watching the meters on this panel.

The history of this development and the many design problems involved have already been reviewed.*

This article is devoted to a description of the control system. The power plant consists of a six-cylinder, vertical diesel engine direct-connected to a three-phase, 230-volt alternator and its shaft-mounted amplidyne exciter. The plant is pivoted in its housing so that it can be swung out from under the car, exposing all sides for easy maintenance. The engine is rated 48 hp. at 1,800 r.p.m., and the alternator is rated 33.8 kva. at 90 per cent power factor. The alternator is designed so that sets may be paralleled at random, regardless of phase difference or small frequency differences. A 200-amp. train line bus is established through the train by special electric couplers. Train line control circuits provide for the automatic paralleling of all plants on the bus when the couplers are made up between cars.

The control equipment for this system may be divided into three groups: Engine control, excitation equipment, and train line equipment for parallel operation. The engine control consists of two small control stations, a relay and contactor for automatic cranking, a fuel limit solenoid, and various thermostats and switches for engine protection, a line contactor, static battery charger, and the engine governor. The excitation equipment cnnsists of a static voltage regulator, a current transformer, and the amplidyne exciter. Train line control equipment con-

* Control Engineering Division, General Electric Company, Erie, Pa.

* "Undercar Engine-Driven Power Plants for Railroad Passenger Cars" by D. R. MacLeod, A.S.M.E. Paper No. 49-F7. Reprinted in Railway Mechanical Engineer, October 1949, pages 578-583.

sists of the train line couplers, a line contactor, and a time delay relay.

Engine Control

The complete control of each car power, load and bus system is placed in one simple three-position switch. In the *OFF* position of this switch the plant is stopped, the system is isolated from the train line bus, and all control load is disconnected from the battery. Train line control circuits are completed; however, so that cars on either side may be trainlined together. In the *TL* (train line) position, the load bus is connected to the train line bus, but the plant is not operating. It is then possible for the car to draw power from the train line without operating its own engine. The third position, *ENG-TL*, is the same as *TL*, except that the engine is running, and the plant is automatically connected to the train line.

To start the engine, the selector switch is turned to the *ENG-TL* position. This closes the cranking contactor and the starter cranks the engine until it fires, or until the cranking time limit relay picks up after 30 seconds. If the engine fails to start, this relay prevents a retrial until the selector switch is turned to *TL* and then back to *ENG-TL*. The relay is also used to delay the closing of the generator line contactor for 30 seconds after the start of cranking if the engine fires before that time has elapsed. This gives the engine time to warm up slightly before having to carry load. The starting of the plant is entirely automatic, leaving nothing to the discretion of the operator, other than the selection of one of the three positions of the control switch.

For control of the plant during maintenance and inspection periods, a three-position switch is placed in the engine box. This is designated as a safety switch, and is marked *HAND-OFF-AUTO*. Except in the *AUTO* position, it takes precedence over the main control station and permits the plant to be operated from the engine box without fear of interruption from the inside control. This is particularly useful in conjunction with the swing-out feature—enabling the power plant to be operated for maintenance purposes when it is out from under the car.

A combined pressure-temperature switch in the lubricating oil system serves a triple purpose. As oil pressure builds up when the engine starts, this switch opens the cranking contactor. It also operates on either low oil pressure or high engine temperature to de-energize the fuel solenoid and shut down the engine.

Another thermostat with separate controls prevents load from being applied to the engine in cold weather until the jacket water has reached 70 deg. F.

The engine is cooled by a separate radiator unit with a motor-driven blower that requires 1.1 hp. This blower is cycled by a thermostat to hold engine cooling water temperature between 163 and 175 deg. F. at the radiator outlet.

A 150-amp.-hr., 32-volt, lead-acid battery is used on the cars of the exhibit train for engine cranking. A rectifier battery charger, rated 15 amp. continuous, supplies control power and maintains the battery charge. This charger has a drooping voltage-load characteristic so chosen as to limit the current when charging a discharged battery, and to avoid gassing when the battery is floating on the line in a fully charged condition. It is connected directly to the car load bus, so that whenever there is power on the car, the battery is on charge.

The parallel operation of alternators gives the engine governor particular importance in this system, since the speed-load characteristics of the engine determine the division of load between plants. In order to secure good division of load between units, all engine governors should be set as close together as possible at no load. Experience indicates that a 5 to 6 per cent droop in speed between no load and full load is desirable. The usual governor damping is adequate to prevent hunting and help maintain system stability.

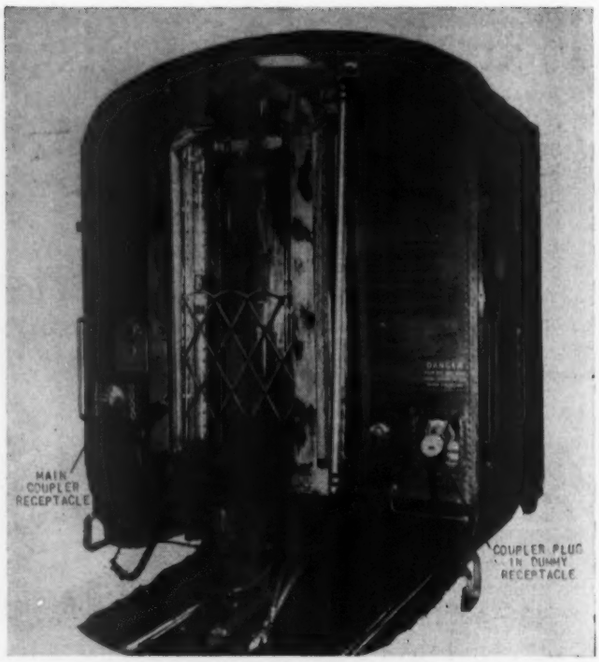


Fig. 2—End of car showing train line connectors

Excitation System

Both the automatic paralleling of alternators without pre-synchronization, and the starting of heavy loads impose severe requirements on the power plants. To minimize the effect of such disturbances on fluorescent lights and other car equipment, an ultra-high speed excitation system is used. This consists of an amplidyne exciter and a high-speed static regulator.

The exciter is fitted with a series field, which will cause its output voltage to go to maximum when there are zero ampere turns on the control fields. When the line-to-line terminal voltage drops to a very low value (as in paralleling two alternators which are 180 deg. out of phase), the exciter voltage goes to the celing value. This is the primary requirement for rapid system recovery.

A boost control field is also provided to preclude the possibility of reversing the exciter polarity when paralleling sets that are 180 deg. out of phase.

The regulating or buck field of the emplidyne is energized from a nonlinear saturable reactor circuit, designed to give a steeply rising current in the neighborhood of 230 volts. This signal is amplified by a magnetic amplifier to a level such that it is capable of driving the exciter to full ceiling voltage in the reverse direction when the line voltage exceeds 230. The combined time constants of the control circuit provide such high-speed excitation voltage changes that field forcing is obtained within two cycles.

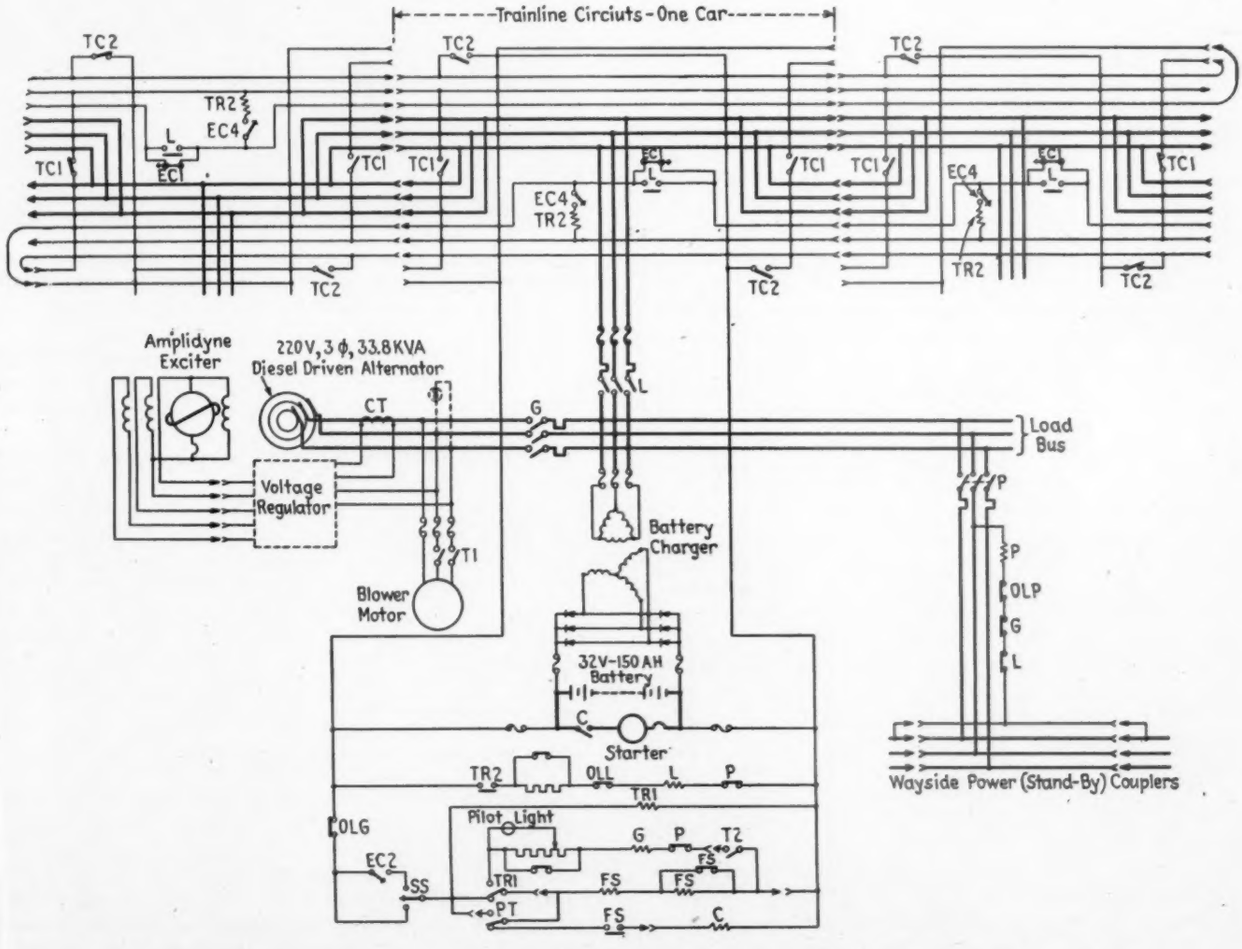
The saturable reactor used as a voltage reference is

also sensitive to frequency. Therefore, a compensating tuned circuit is used to insure constant voltage over a frequency range of 58 to 62 cycles. The result is that with unit power factor load the voltage variation is about ± one volt.

Only the saturable reactor, the input transformer, and the control resistors play a significant part in setting the regulated voltage. All of these elements are static and have extremely stable characteristics, so it is expected that the voltage of any particular power plant and regulator will not drift appreciably during many years of operation. Furthermore, experience indicates that any combination of power plant and regulator will give a voltage not more than three volts away from the 230-volt nominal, without adjustment. The voltage can be adjusted over a wide range by means of taps on the input transformer and the saturable reactor.

A reactive current bias is provided to equalize the voltages of plants operating in parallel without excessive circulating current flow. A current transformer is connected in one line to provide a voltage signal which is in quadrature with the regulator voltage signals taken from the other two lines. This cross-compensating causes the regulator to act as if the voltage were high or low, as the case may be, and it adjusts the excitation accordingly. The resultant lowering or raising of the generated voltage is compensated by the desired flow of reactive current through the generator impedances. In addition, the cross compensation causes some regulation. For instance, with 0.9 power factor lagging rated load, the voltage droop is about 4 per cent. The division of reactive load between alternators operating in parallel is determined by the generated voltages and the impedances between them. Therefore, their no-load voltages should be set as close together as possible.

The radial system of power distribution is employed in the power train line. Once the cars are coupled together, there is a continuous bus from end to end of the



G. Generator contactor
L. Trainline contactor
P. Wayside power contactor
C. Cranking contactor
TR1. Cranking time limit relay
TR2. Trainline time delay relay
T1. Radiator blower thermostat
T2. Cold engine thermostat
PT. Low oil pressure-high water temperature switch
FS. Fuel solenoid
CT. Current transformer
SS. Safety control station
EC. Engine control station
TC. Trainline coupler interlock
OLG. Generator overload relay
OLL. Trainline overload relay

Fig. 3—Schematic diagram of undercar power plant installation showing trainline circuits of three cars

train. Each car's generator, load and bus system constitutes a branch from this main bus. A train line contactor isolates the car system from the bus, but does not interrupt the bus.

Power connections between cars are made by parallel couplers, one on each side of the car. The train line bus is not interrupted until both coupler connections are broken. Each end of every car has a plug and dummy socket on the right and a main socket on the left. Hence, two cars may be coupled together regardless of how they are faced.

Although there arctually is a difference in the electric circuit as viewed from the two ends of a car, it is possible to couple cars at random in a train. The diagram, Fig. 3, shows two cars faced in one way and one the opposite way.

The only effect of the direct in which the cars are faced is to control the sequence of paralleling. All of the train line relays on cars faced in one direction are operated by the battery on one end car. All relays on cars turned the other way are operated by the battery on the other end car. When the train line control circuits are completed, the relays begin closing in sqeuence at intervals of 10 seconds. If all the cars are faced one way, only one sequence will be set up. If they are coupled at random, two simultaneous sequences will be set up—one in each group of cars. Therefore, not more than two power plants can come onto the line at the same time, and not more than two can come on in any 10-second period.

Completion of the last coupler connection in the train initiates the paralleling sequence. Both coupler connections between each pair of cars must be made up, and the connections on both end cars must be properly made before the control circuits will be complete. Furthermore, when any one connection is broken, all train line relays are instantly opened, and the train line bus isolated within a fraction of a second. This means that no plug can remain hot when its contacts are exposed. Also, because of the parallel connections, no one plug can interrupt the train line power bus. Once one of the two connections is broken, the bus is isolated from all the power plants in the train and the other plug can be pulled without interrupting power on its contacts. The control circuits also pass through a receptacle cover interlock on each end car. Lifting this cover to expose the contacts has the same effect as pulling a coupler plug, instantly isolating the train line bus. This insures that the train line is dead while cars are being coupled.

Each coupler plug carries three control wires, making a total of six train line control circuits between each pair of cars. Actually, there are only two complete circuits involved, each originating and terminating in one end car battery and passing through each coupler plug, and end car coupler cover interlock at least once. The two circuits are so arranged that no two batteries can pe connected in parallel.

Each of the two train line circuits controls the sequence of all cars faced one way electrically. The closing of the contacts of the first relay energizes the train line contactor on that car. A normally open interlock energizes the next train line relay in the sequence to pegin its 10-second timing, and so on. This circuit is connected straight through the cars which are faced in the opposite way, so the sequence is not affected. When a car control switch is in the *OFF* position, it short-circuits the train line contactor interlock and opens the train line sequence relay circuit. When the sequence reaches this car, the relay fails to close; but, because the interlock circuit is completed by the control switch, the sequence passes on to the next car. In this way, the full control of each car system is kept within the car.

Fig. 4—Exhibit panel in General Electric exhibit train used to demonstrate the operation of the undercar power plants

From the point of view of operating personnel, the system is extremely simple. It is only necessary to plug in the train line jumpers at the same time that the air and steam hose connections are made. The paralleling sequence is entirley automatic and no knowledge of the circuits involved is required on the part of the men. The trainman on a car simply turns the control switch to *TL* and he has the power instantly, if power is available in the train, or he turns it to *ENG-TL* and, in addition to power from the train line, in 30 seconds its own power plant is helping to carry the car load.

Dual Plants for All-Electric Diners

If an all-electric diner were to be operated permanently in a train equipped with undercar power plants, it could be equipped with only one set, the same as the other cars. The 50- to 60-kw. load of the diner would be shared by all plants operating on the train line. The probability, however, is that railroads will prefer to have two power plants on a diner so that it may be operated as an independent unit in any type of train or in parallel with similar equipment on other cars. Standard equipment may be used for such installations.

These power plants will be connected to the train line bus in exactly the same way as are separate car systems. The diner load will be shared by all plants on the train line bus. A dual plant load-control scheme enables one plant to be operated continuously, while the other is brought on during periods of heavy load only. This is

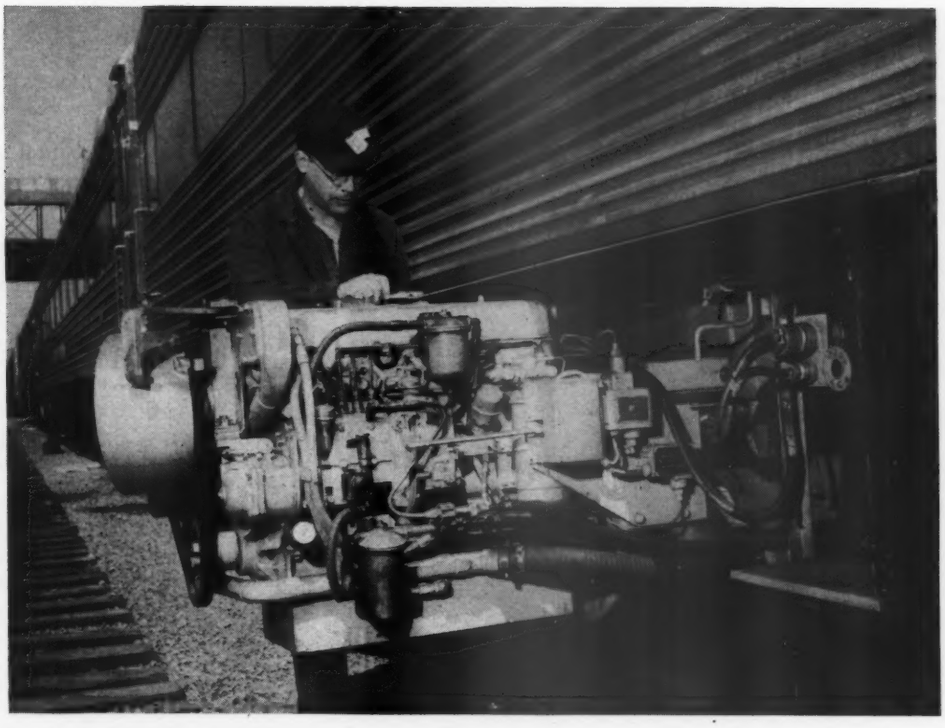


Fig. 5—Undercar power plant swung out for inspection

accomplished by using a standard control for each plant and one small load control panel in addition.

This new system of passenger car power supply has been tested in practical service and has proved to be a much more reliable source of power than if the cars were not paralleled. It also offers other advantages, such as extra reliability and the possibility of shutting down engines not required by the train load. Even when operated as isolated units, this simple control offers numerous advantages. The engine control scheme provides for automatic cranking as well as safety control at the engine box for inspection and maintenance purposes. The engine is automatically protected against overheating, low lubricating oil pressure, and cold starts under load. A separate radiator fan, thermostatically-controlled, assures proper engine operating temperature. The battery-charging equipment is of the simple, dependable static type.

The specially-designed excitation system gives extremely high-speed recovery from all types of line disturbances, thereby minimizing lamp flicker. Circulating current is kept to a minimum, and the voltage setting of the plants is exceptionally stable. The static type voltage regulator employed insures reliable operation and low maintenance. Plants and regulators are interchangeable.

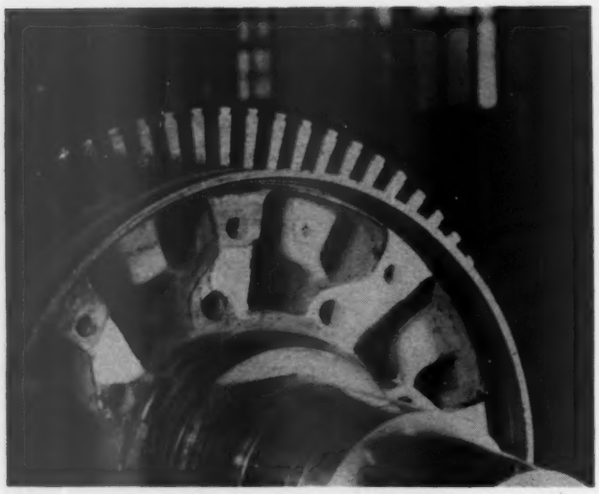
The train line system adopted gives fully automatic paralleling of power plants without complicated and expensive synchronizing equipment. It also insures complete flexibility in train make-up, and retains the independent control of each plant within its own car without affecting parallel operation of other cars.

Components of the system have been kept as few in number, and as simple, as possible to promote reliability and reduce maintenance cost.

* * *

One piece of submarine cable being shipped in nine open-top cars from the Okonite Company plant in Paterson, N. J., to Renton, Wash., where it will be used to transmit 25,000-volt power under Puget Sound from Bonneville Dam to the San Juan Islands, Wash. The cable, 4 2/3 in. in diameter, is laid around forms inside the cars, and extended from one car to the next in a vertical loop. Cars are fitted with safety chains, and coupler pins are tack-welded to insure against possible uncoupling

CONSULTING DEPARTMENT



Should Core Slots Be Sand-Blasted?

What shop practices, if any, are necessary to prevent excessive core loss in traction motor armatures?

In production work, we avoid work on the inside of the slots as much as possible by having the iron stacked carefully to produce smooth and clean slots to receive the coils. Perfection is not always possible; consequently, if any of the punchings do project into the slots, we smooth these off by driving into the slot a hardened steel bar or drift which closely fits the slot. Obviously, this operation will smooth down any high spots in the punchings and will localize, to these corrected high spots, any heating due to increased eddy currents caused by the breakdown of insulation resistance between laminations. Special treatment of the laminations forms an insulating medium between punchings and provides resistance to eddy currents in the core.

When this resistance between laminations is destroyed, the eddy current losses do increase. Since sand-blasting would tend to make a continuous current path for eddy currents produced by the cross-slot flux, it is not recommended for clearing up the slot imperfections.

In a real exaggerated condition of misalignment of a few laminations in the core, we might actually hand file to bring the slot to right proportions. In no case do we sand-blast nor do we advocate it.

In the case of reconditioning armatures, where it is necessary to clean out varnish in the slots, we suggest stuffing the slots with rags saturated with benzine or toluol, for softening the varnish so that it can be wiped out manually.

On repair jobs, if an armature is to be rewound and we find that some laminations are high in the slots due to loosening or vibration, we still resort to a hand file to smooth up these local spots. If any corrosion exists, we would try to polish that off by hand. In no case, therefore, do we advocate sand-blasting to clean off dirt or to smooth up slots due to high punchings.

H. E. DRALLE
Westinghouse Electric Corporation

Car Electrical Equipment

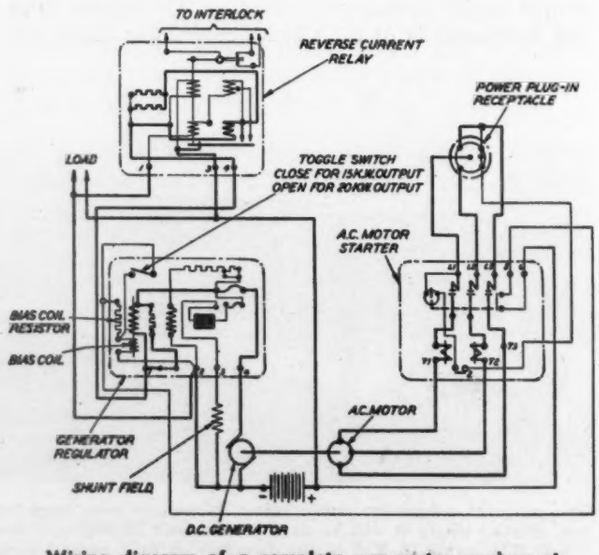
Questions and Answers

Q.—What is a bias coil and why is it used in connection with the genemotor equipment for railway car lighting and air conditioning?

A.—The bias coil is a voltage winding inside of the current coil of the regulator. This bias coil is connected across the battery through an interlock on the a.c. starter panel. When this coil circuit is closed, it influences the current coil arm—in other words, exerts a stronger pull on the current coil plunger.

The bias coil is used on the generator regulator used with a genemotor, which is a d.c. generator in combination with a 3-phase, 60-cycle, 220-volt a.c. motor in a common housing. With this regulator, it is possible to obtain full generator output when the genemotor is being driven from the car axle and then when operating from a.c. standby, the generator output can be reduced to either the capacity of the a.c. motor or the capacity of the a.c. lines. This accomplished as follows:

When the a.c. power plug is inserted, the a.c. starting contactor closes, and at the same time, the normally open interlock to which the bias coil is connected, is also closed, thereby putting this coil directly across the battery. This exerts a certain amount of pull on the current coil plunger even when the current in the current coil is zero. To this pull is added the pull of the current winding when the generator builds up. The result is that the regulator becomes operative at a lower current value than when the bias coil is not in the circuit.



Wiring diagram of a complete genemotor equipment showing the bias coil circuits

it possible for a railroad to select a genemotor having an a.c. motor of the proper capacity. For example, should a train operate over lines where the a.c. lines and circuit breakers at the terminals can handle the maximum output of a 32-hp. motor, then full generator output would be available with a 20-kw. genemotor, equipped with a 32-hp. motor. Should the same train operate over a portion of a line where the a.c. lines could only handle the output of a 20-hp. motor or less, then the generator output could be reduced to the proper value when operating on a.c. standby, by simply cutting the bias coil into the circuit. This is accomplished with a small toggle switch on generator regulator.

In some cases, the a.c. lines or circuit breakers cannot handle more than the output of a 20-hp. motor. Then, if a regulator with a bias coil is used, the railroad can purchase the maximum capacity generator, but equipped only with a 20-hp. motor. This gives them the full advantage of the larger generator when driven from the axle, but limits the standby power to the available power in the circuit. This, of course, results in a lower priced machine.

A. A. DOBIE
Safety Car Heating and Lighting Company, Inc.

Complete specific gravity and voltage readings of the entire battery when on charge is the only way that a true determination of the battery condition can be made

Diesel-Electric Locomotive Batteries

Questions and Answers

Q.—Why does a cell read reverse when the engine won't start?

A.—A normal cell will not reverse until it is completely discharged, and the engine refusing to start has no bearing on the reversal of the cell other than completely discharging the cell.

Q.—How hot can a battery get before harm is done?

A.—Standard battery practice is to try to maintain the temperature of the battery below 115 deg. F. Continuous operation of a battery at higher temperature than that can only result in permanent harm to the plates.

Q.—Should battery compartment be ventilated?

A.—Yes. This enables the fumes from the battery to escape and prevents acid fumes from attacking the terminals, connectors and inside of a battery compartment. It helps to keep the battery cool and eliminates a concentration of gas which is highly explosive.

Q.—Why is one battery 1.280 gravity and another 1.250?

A.—The capacity of a battery required for diesel starting determines the specific gravity. The space available for a storage battery has a definite bearing on the specific gravity, as well. If a large plate battery can be used, a lower specific gravity will give longer life and just as good performance. In a small compartment it will be necessary to install a lower plate battery, and then in order to get the required starting current, a higher gravity of 1.280 must be used. An automotive battery must be as small and compact as possible, therefore, small plates are used and higher specific gravity (1.300) is normally used.

Q.—Does it hurt a battery to start the engine if the battery is low?

A.—No. Unless a battery is completely discharged and trying to start the engine completely reverses the entire battery. If there still remains current enough to start the engine, the auxiliary generators will recharge the battery while in service.

Q.—How much drop in specific gravity can be expected over the life of the battery?

A.—A gradual reduction of specific gravity may be expected as the battery ages. This reduction should not exceed 15 to 20 points during the life of the battery, and should be taken into account when the battery is recharged from an outside source.

Q.—What allowable differences between ambient and battery temperature is considered satisfactory operation?

A.—With proper voltage regulator setting, the battery temperature will be within a few points of the ambient temperature. Consistent high battery temperature is an indication of too high a voltage regulator setting.

Q.—How can I determine in advance when a battery should be replaced?

A.—Complete specific gravity and voltage readings of the entire battery when on charge is the only way that a true determination of the battery condition can be made. If there are considerable differences in voltage and gravity between cells, the battery should be shopped. A bench discharge test will then give the actual remaining capacity of the battery and from this test a decision can be made as to whether the battery should be replaced or not.

Q.—What difference in specific gravity between the highest and lowest cell readings would you consider unsatisfactory?

A.—When one or more cells read 20 points or more below the specific gravity of the balance of the cells, an investigation should be made to determine whether the battery is receiving sufficient charge, over-flushed or just what is causing variation between cells.

Q.—What variation in cell voltages, highest to lowest cell readings, would you consider unsatisfactory?

A.—If there is a variation of more than .20 volts between cells, when battery is charging, this would be considered unsatisfactory and the battery should be shopped.

K. A. VAUGHN
Gould Storage Battery Corporation

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives

Miscellaneous Equipment

158-Q.—What time is allowable in the yellow zone? A.—Yellow zone operation is permissible for a consecutively or accumulated time not to exceed 90 minutes.

159-Q.—What is permitted in the white zone? A.—Continuous operation.

160-Q.—What type of Speed Transition Meter is used for units having manual transition? A.—The type equipped with two scales.

161-Q.—What do the scales represent? A.—The outer scale is calibrated in miles per hour while the inner scale is marked: 1, 2, 3, and 4, which represents the four transition positions of the selector handle.

162-Q.—What should be done as the speed of the locomotive increases or decreases? A.—The selector handle should be moved to the corresponding position indicated by the pointer.

163-Q.—What type Speeed Transition Meter is used on units having automatic transition? A.—On such units a type is used on which the inner scale is omitted, leaving only the scale for miles per hour.

164-Q.—How many air gauges are furnished and what pressures do they indicate? A.—Two standard air gauges are furnished, one indicating brake cylinder and brake pipe pressure while the other indicates main reservoir and equalizing reservoir pressure.

165-Q.—What minimum battery voltage should be indicated by the Battery Voltmeter with the engine shut down? A.—With the engine shut down and the battery switch closed, the voltmeter should indicate a voltage of 64.

166-Q.—What should a lower reading than this indicate? A.—That the battery is not charged or has faulty cells.

167-Q.—What does the battery voltmeter indicate with the engine running? A.—Auxiliary generator voltage.

168-Q.—What voltage should be indicated under these conditions? A.—The needle should be in the green area at approximately 74 volts.

169-Q.—How does the Auxiliary Generator Ammeter function. A.—It indicates the ampere output of the auxiliary generator and should normally show a slight charge.

170-Q.—What will cause the output to vary? A.—The variation depends on the auxiliaries being operated and the amount of battery charging.

171-Q.—Name some of these auxiliaries. A.—Fuel pump motor, crank case exhauster, motor generator set, eddy current clutch, etc.

172-Q.—At which time will the auxiliary generator ammeter show a high charging rate? A.—Immediately after cranking the engine.

173-Q.—What is the purpose of the Engine Tachometer? A.—This instrument denotes Diesel engine speed.

174-Q.—What is the speed range? A.—350 rpm. idle to 1000 rpm. full engine speed.

175-Q.—What pressure should the Lubricating Oil Pressure gauge indicate at idling speed? A.—20-25 psi.

176-Q.—What pressure at full engine speed? A.—45-60 psi.

177-Q.—What pressure should the Fuel Oil Pressure Gauge indicate? A.—35-45 psi. at all engine speeds.

178-Q.—What is the function of the Booster Air Pressure Gauge? A.—This gauge indicates turbosupercharger air pressure to the Diesel engine.

179-Q.—How much pressure should the gauge show? A.—15-18 psi. with the throttle in the eight notch fully loaded and correspondingly lower values in lower throttle notches.

180-Q.—Where is this gauge on road switchers? A.—Under the hood on the left side of the radiator compartment bulkhead.

181-Q.—How does the Engine Water Temperature Gauge Function? A.—This gauge indicates temperature of the cooling water out of the left bank header of the engine.

182-Q.—What is the normal operating temperature? A.—140 to 160 deg. F.

183-Q.—Where is the Control Air Pressure Gauge located on road locomotives? A.—In the nose on the fireman's bulkhead.

184-Q.—Where is it located on Road Switchers? A.—On the engine control panel.

185-Q.—How much pressure should it indicate? A.—70 psi.

186-Q.—What is the purpose of the Radiator Fan Control Air Pressure Gauge? A.—It indicates the pressure for operation of the electro-pneumatic fan control switches.

187-Q.—Where is this gauge located on road locomotives? A.—It is mounted at the right of the engine control panel on the older models. On the new model 1,600 RFP the gauge is next to the radiator fan control panel.

188-Q.—Where is it located on road switchers? A.—To the right of the fan control under the hood on the left side of the radiator compartment bulkhead.

189-Q.—What pressure should this gauge indicate? A.—15-17 psi.

190-Q.—For what purpose is the main reservoir gauge which is located on road locomotives on the left side wall? A.—It is located near the air compressor governor and is used as a guide in setting the governor.

191-Q.—We have a second water temperature gauge, where is it located and what is the normal operating temperature? A.—It is located in the right engine outlet waterheader near the radiator compartment. The normal operating temperature is 140-160 deg. F.

Alarm and Indicator Lights

192-Q.—When does the Hot Engine Light function? A.—When the temperature of the engine cooling water reaches 185 deg. F.

Steam Locomotive Boilers

By George M. Davies

Height Over Crown Sheet

Q.—What is the most desirable distance between the top of the crown sheet and the inside of the boiler shell at the top; for a locomotive boiler?—R.M.T.

A.—The most desirable distance between the top of the crown sheet and the inside of the boiler shell at the top for a given boiler is that which will permit the largest possible gas area through tubes and flues without restricting the steam space to the extent that there is water carryover into the superheater and cylinders.

Removing Staybolts with Torch

Q.—What is the correct method for removing rigid staybolts with a cutting torch so that the wrapper sheet will not be damaged?—R.E.L.

A.—Staybolts are removed by flame cutting by holding the tip of the cutting torch in line with the bolt so that the preheating flames contact and heat the edge of the telltale hole. When heated sufficiently the oxygen is turned on gradually. The torch is then slowly rotated around the telltale hole until the center of the bolt, for a depth of 3/8 inch, is consumed. The direction of the cut is changed 45 deg. and the bolt pierced through to the water space. By rotating the torch slowly at this same angle the bolt is cut without damage to sheet or threads. The small burr remaining in the threads is then removed, completing the operation.

Water Glass Location

Q.—In complying with Rule 37 which states, "that the lowest gauge cock and the lowest reading of the water glass shall be not less than 3 inches above the highest part of the crown sheet," how often is it required that the distance between the water glass and the top of the crown sheet be checked?—R. E. K.

A.—The height of the crown sheet in a locomotive boiler cannot be termed as permanent due to service conditions and repairs and although there is no rule as to definite intervals at which time the distance between the lowest gauge cock and the lowest reading in the water glass to the top of the crown sheet should be checked it would appear that this distance should be checked, by the methods used by the railroad for locating these parts, after the application of a new rear tube sheet, a firebox removal, or any repairs that could in any way possibly effect the height of the crown sheet.

How To Test Welded Seams

Q.—When applying an all-welded shell to a locomotive boiler what provisions are made for testing the shell, since it is not possible to test the welded seams under pressure at time of construction?—R.E.V.

A.—The all-welded shell is tested under pressure after it is applied to the boiler, it is given the first hydrostatic prior to application of superheater header or units.

The boiler is subjected to a hydrostatic test of 1½ times the designed pressure and while subject to this pressure all butt-welded joints which are unsupported by other means, and all other welded joints where such a test is feasible, is given a thorough hammer or impact test. This impact test consists of striking the plate at 6-in. intervals on both sides of the welded joint and for the full length of all welded joints. The weight of the hammer in pounds shall approximately equal the thickness of the shell in tenths of an inch, but not to exceed 10 lb., and the plate shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plates.

Following this test, the pressure should be maintained at not less than one and one-half the designed pressure and held there for a sufficient length of time to enable exterior inspection of all joints and connections.

Pin holes, cracks or other defects should be repaired only by chipping, machining or burning out the defect to clear metal, and re-welding. For gas welding, the metal around the defects shall be pre-heated to a dull red for a distance of at least 4 inches all around. Any preheating means may be used, such as flange fire, gas or oil burner, or a welding torch. The preheating shall be done slowly, so that the heat will get well back into the plate and expand it thoroughly. For metallic arc welding, preheating or reheating is not required. After any repair welding, the area in the vicinity of the weld shall be stress-relieved by heating to a dull red to equalize stresses, and then cooled slowly.

Any repair welding that may be necessary will be performed by a welder qualified in conformance with the requirements of the A.S.M.E. Code. All repair work to welded seams as above specified should be done under the direct supervision of a qualified inspector.

Boiler to be absolutely tight at hydrostatic test.

Following the first hydrostatic test, if repairs have been made to any welded joints, apply hydrostatic pressure of 50 per cent over designed or working pressure. The boiler must be absolutely tight during this test.

If no repairs are made to any welded joint during first hydrostatic test, the second hydrostatic is not required .

Following the hydrostatic tests draw off solution in boiler to reduce water level to about 14 inches above crown, then fire up boiler and test under own steam to 20 per cent above working pressure; the time to be consumed in raising the required steam pressure to be 4½ hr., after which blow back the pressure to 100 lb., then raise the steam again to required pressure and caulk all leaks. Leaks in welded seams in course assembly must not be caulked.

Maintain boiler pressures (20 per cent above working pressure) for about one hour, then cut off burner and allow pressure to drop to 100 lb., blow off all steam pressure slowly before water is drained. Drain boiler. Remove all four corner washout plugs and let boiler stand until absolutely cold, after which the boiler shall be entered and the interor surfaces and connections examined as conditions will permit. Apply superheater header and units and apply hydrostatic pressure of 25 per cent over working pressure to test superheater header and unit joints.

Fire up boiler and test under own steam to 20 per cent above working pressure, water level to be maintained at two gauges and time to be consumed in raising required boiler pressure to be 4½ hr.: and caulk all leaks. Leaks in weld seams in course assembly must not be caulked. (When pressure reaches 100 lb. per square inch, blowout header and units.)

After the second fire test has been successfully completed, blow off the steam pressure and then slowly drain boiler of all contents.

Future repairs to any all-welded seams or liners in shell course assembly, which may become necessary after service of boiler, are to be made in accordance with established practice in the application of repairs to locomotive boilers of conventional construction.

Schedule 24 RL

Air Brakes

OVERSPEED PROTECTION FEATURE — H-24-C RELAYAIR VALVE UNIT (*continued*)

***1080-Q.—What results from air flowing to the chamber over diaphragm* 10?** A.—The diaphragm will move downward seating valve *17* which will prevent the *No 10* line from exhausting to atmosphere through the overspeed application valve.

1081-Q.—Why is this only a temporary suppression? A.—Air in the *17* line can exhaust to atmosphere through choke *2* in the H-24-C relayair valve unit at a predetermined rate, allowing diaphragm *10* of the overspeed suppression valve to move upward opening valve *17*.

1082-Q.—What happens when valve* 17 *is opened? A.—The *No. 10* line is reconnected to the atmosphere through the overspeed application valve and causes a service brake application if the overspeed condition has not been relieved.

1083-Q.—How is a temporary suppression obtained when the emergency application portion is used? A.—By placing automatic brake valve handle in first service, service or lap position while the equalizing discharge valve is open.

1084-Q.—How does this cause a temporary suppression? A.—Brake pipe exhaust is connected through passages *17* and *26*, pipe *26* to passage *17* of the H-24-C Relayair valve unit to the top of diaphragm *10* of the overspeed suppression valve.

1085-Q.—What will bring about a permanent suppression? A.—This is obtained when control pipe *16* pressure reaches about *30* lb.

1086-Q.—Explain how the air in pipe* 16 *causes a permanent suppression. A.—Air flows from the D-24 control valve through pipe *16*, passage *16* and passage *8* in the H-24-C Relayair valve unit, to chamber *D* of the cut-off valve. When the pressure reaches about *30* lb. diaphragm *10* will move downward and close valve *16* which cuts off the *No. 10* line from atmosphere and holds the application portion piston in release position.

HA-24-C RELAYAIR VALVE UNIT

1087-Q.—How many relayair valves are mounted on this unit? A.—Five.

1088-Q.—Name them. A.—Cut-Off Valve; Overspeed Application Valve, Overspeed Suppression Valve; Sanding Valve; and Brake Pipe Cut-Off Protection Valve.

1089-Q.—Two of these valves have not been discussed previously, the Sanding Valve and Brake Pipe-Cut-Off-Protection Valve. How does the Sanding Valve function? A.—The Sanding Valve operates from the D-24 Control Valve (during an emergency application) or from the automatic brake valve (during an overspeed, train control or safety control application) and permits the flow of air to the sanders. It also operates the brake pipe cut-off protection valve.

1090-Q.—How does the Brake-Pipe Cut-Off Protection Valve function? A.—It provides protection against loss of main reservoir air and possible release of the brakes, from an emergency application started from the train when the brake valve handle remains in running position.

1091-Q.—Does this valve protect against loss of main reservoir air caused by a broken main reservoir equalizing pipe? A.—It does not.

1092-Q.—Are these valves interchangeable? A.—Valves *1, 3, 5* and *6* are all interchangeable but valve *4* operates at a different pressure, requiring another type of spring.

1093-Q.—What pressure operates the sanding valve when an emergency application takes place? A.—Emergency reservoir air is connected from the control valve to passage *15*, pipe *15* to passage *15* of the relayair valve unit, to chamber *N* of the sanding valve.

1094-Q.—What then happens? A.—Air in chamber *N* depresses diaphram *10*, opening valve *15*, connecting the volume reservoir, pipe *31*, passage *31* to passage *9* to the sanders.

1095-Q.—What provides the proper blow down time for the sanding reservoir? A.—A choke fitting in passage *9* of the Relayair valve unit.

1096-Q.—What other connection is made from passage 9. A.—Air pressure from passage *9* is also connected to chamber *R* of the brake pipe cut-off protection valve.

1097-Q.—What action then takes place. A.—Air pressure in chamber *R* moves diaphragm *10* down, opening valve *15*, venting passage *10* to the atmosphere.

1098-Q.—What movement takes place when passage 10 is vented? A.—Brake application piston in the brake valve is then moved to application position.

1099-Q.—What desirable result is thus obtained? A.—Communication is thus cut off from the main reservoir to the brake pipe preventing loss of main reservoir pressure.

AUTOMATIC TRAIN CONTROL

1100-Q.—What are the parts required for Automatic Train Control? A.—NS-1 reducing valve; magnet valve; timing valve; stop reservoir; whistle; brake application valve circuit controller; sealed cut-out cock; A-1 suppression valve; acknowledging valve; No. 1 and No. 2 acknowledging reservoirs; suppression reservoir 19; suppression timing reservoir and timing valve reservoir.

1101-Q.—How does the NS-1-reducing valve function? A.—The NS-1-Reducing Valve used with the *C* signal valve, located in the main reservoir pipe to the cab signal magnet is used to reduce main reservoir pressure for use in the cab signal system.

1102-Q.—What is the magnet valve for? A.—For the cab signal system with whistle and acknowledging valve.

1103-Q.—How does the timing valve function? A.—It automatically applies the brake when initiated from a train control application in train stop territory and operates the timing valve whistle and fireman's call signal circuit controller in cab signal territory.

1104-Q.—What is the stop reservoir used for? A.—Connected to the timing valve and the brake valve, it is used to enforce a time interval and insure completion of a stop when a train control application takes effect.

1105-Q.—How does the whistle function? *A.*—The whistle is connected to the timing valve and blows a warning when a train control stop application or cab signal is initiated.

1106-Q.—What is the purpose of the brake application valve circuit controller? A.—To prevent the release of a train control, overspeed or safety control application until after the train has come to a stop, once the application piston moves to service position.

1107-Q.—What is the purpose of the sealed cut-out cock? A.—The cock is located in the pipe between the timing valve and the service piston of the brake valve and cuts out train control operation when it is not desired.

EDITORIALS

A Satisfactory Basis For Diesel Repairs

What is the most satisfactory basis for setting up a program of repairs to diesel locomotives which will assure desired results? Frankly *Railway Mechanical and Electrical Engineer* doesn't know the answer to that question and discerns quite a difference of opinion among various experts in the field. Sometimes diesel motive power is maintained more or less on a time basis which does not take into consideration the use factor, or mileage made. In other cases, inspection and repair periods are scheduled in accordance with mileage figures which apparently overlook the fact that, in the interest of safety, time limits are generally desirable for the replacement of certain parts more or less without regard to the length of service.

It is probable that a combination of the two methods mentioned will best produce desired results which may be summarized as the servicing and maintenance of diesel locomotives in such a way as to give most effective and reliable service at least cost. One thing is sure, namely, that any maintenance program which calls for either inspection or repair and replacement of parts at more frequent intervals than necessitated by their actual condition is an economic waste which railroads can ill afford, not only on account of the extra cost involved, but because badly needed equipment is held out of service that much longer.

Moreover, experience with diesel locomotives shows that parts which are giving entirely satisfactory service sometimes fail soon after being inspected and tampered with by inexperienced or improperly trained workmen. At the January 15 meeting of the Northwest Locomotive Association, this fact was confirmed by an incident cited in the paper on "Diesel Engine Maintenance," by M. Sudheimer, educational director of Electro-Motive. According to the account, the main-bearing shells of a diesel locomotive came due for inspection at a certain shop and a machinist asked his helper to "drop the main bearings." Evidently this helper was quite literal minded for he did just that—dropped all of them from front to back of the engine. The crankshaft came down also and there was no trouble whatever in rolling out the upper halves of the main bearing shells.

After inspection, the main bearings were replaced and tightened again, using the correct torque wrench—but beginning at the rear of the engine, working to the front and neglecting to recheck the rear main bearing for any change in torque reading. It is not surprising that after a short period of service the crankshaft of this locomotive had to be replaced. Even with the most experienced and skillful maintenance forces, it seems reasonable that accurately fitted diesel locomotive parts which give no evidence of trouble and are apparently still well within the service life of the material from a fatigue standpoint should be continued in uninterrupted use. If taken down for inspection and the measurement of infinitessimal wear, there is too much chance that subsequent adjustment may not be as accurate as at first and momentary carelessness may introduce dust or abrasive particles into the wearing surfaces.

"The First Diesel and The Last One, Too"

Back on page 52 of this issue there is a story by one Dave Andrews which purports to be a true narration of the trials and tribulations of a shop gang on a small railroad that had been running "down hill" for several years until its obsolete steam power had reached such a state of disrepair that there was nothing left to do but buy some new power or go out of business. Naturally, the diesel was the answer. The story tells about their introduction to their first diesel.

The real value of such a tale lies in the unconscious recounting of the year-after-year depreciation in the physical condition of a railroad property especially with respect to the facilities used to maintain and service motive power and cars. It's a viscious circle wherein shortsighted management too often trades the few dollars that a sensible policy of shop and terminal improvements would cost against what it thinks is a saving in current equipment maintenance costs and winds up several years later to discover that as motive power and car equipment improve in design or type, inadequate servicing and repair facilities not only cause unnecessary out-of-service time but run up the unit cost of car and locomotive, maintenance as well.

The story brings home the behind-the-scenes difficulties of getting "our first diesel" back on the road with nothing to work with and also shows how foolish it is to expect even the first unit to perform satisfactorily and economically unless, along with its initial cost, is included the collateral appropriation for suitable repair facilities.

Experience with diesel power has demonstrated again and again that the builders' early sales arguments that "you don't need any elaborate shops to maintain a diesel" are pretty well discounted and that any road that tries to economize by getting along without modern repair shops for either its first diesel—or the last one—is heading for a rude awakening when the bills come in. Ten or twelve—or even three hours—of unnecessary out-of-service time is too much penalty to pay on the investment and revenue-producing ability of a $150- or $200-thousand locomotive unit.

Everything That Runs Requires Care

A supervisor at a small servicing point where both steam and diesel power are serviced related an occurrence on his road that unfortunately all too typically represents mechanical-department policy today on many roads, with an appalling financial result. This particular incident concerns cylinder packing for several classes of fairly modern steam power. Before the large-scale adoption of diesel power, when steam locomotives were given somewhere near the attention necessary to assure economical operation, this packing lasted an average of about a year and a half. Today it usually requires renewal monthly.

Dramatic as this reduction in packing life is—to about a twenty-fifth of what it was less than a decade ago when allowance is made for the lower mileage now being turned in by the steam power—it is not half so startling as the fact that nobody seems to care. Everybody seems to be too preoccupied with diesel problems to bother to find out whether the difficulty results from improper water treatment, carrying the water too high while running, poor alignment or any other of a dozen possible causes.

Thus a couple of thousand dollars a year is wasted for each locomotive experiencing this trouble without any time or effort being expended to find the cause and the cure. Surely a little time out could be profitably taken from diesel problems to remedy at least the outstanding steam-locomotive troubles. The preceding case is not an isolated one. Comparable money-wasting difficulties resulting from neglect are common on the majority of steam locomotives today in all parts of the country.

The cost of ignoring the steam locomotive goes beyond the obvious additional expenditure resulting from unnecessarily frequent parts replacement, and the inconvenience of holding the locomotive out of service. It also has a bad effect on the morale of the supervisor who is understandably puzzled by the lack of attention to difficulties that he knows are costing plenty of good money but which he also knows could be eliminated without undue time or effort. The effect of this on his attitude can be easily guessed, as can be the effect on his morale when he finds himself being censured for things that seem much less important.

NEW BOOKS

THE DIESEL-ELECTRIC LOCOMOTIVE HANDBOOK—*Electrical Equipment. By George McGowan, technical consultant. Published by Simmons-Boardman Publishing Corporation, New York. 290 pages, illustrated, 5½ in. by 8¼ in. Fabrikoid binding. Price, $4.95.*

This is the second of a two-book series on the diesel-electric locomotive and is devoted to the electrical equipment of the locomotive. The material is so presented that one man with an ordinary layman's knowledge of electricity will be introduced to the subject with little difficulty.

The book begins by discussing at some length the reason for the adaption of the electrical transmission to the diesel locomotive. The advantages and disadvantages are shown and the subject is developed to indicate the limitations of the equipment used. The reasons for transition of circuits during operation and the necessity for precise operating technique are shown.

Common electrical terms are defined and explained and common electrical formulas given. The various circuits in the locomotive and the reasons why they are necessary are explained. Schematic wiring diagrams are explained and the various symbols used on these diagrams are identified by their function in the electric circuit.

The principles of electric generation are described and the construction and operation of the electric traction generator is explained. With the information given in the electrical fundamentals it is easily shown what troubles may occur to the generator because of overload or improper handling in operation. The traction motors are similarly discussed.

A chapter is devoted to the function of the exciters, auxiliary generators and motor blowers and their relationship to the operation of the locomotive as a whole. Construction details and specific duties are outlined.

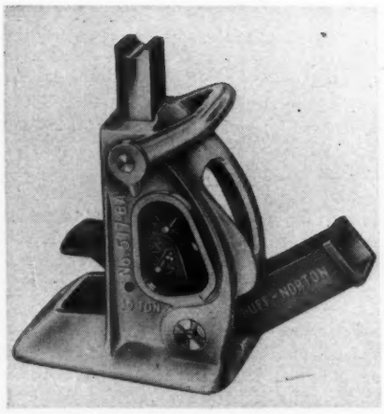
Storage batteries are covered in detail. Their function and duties in the locomotive are outlined and the function of the voltage regulator in relation to the battery is demonstrated. The proper use of the battery and the steps to take to avoid failures in service are pointed out.

The construction and functions of the various types of switches, such as contactors, relays, circuit breakers, magnet valves and interlocks contribute to the subject matter of the last general chapter.

The final chapters, one each for the major builders—American Locomotive-General Electric, Electro-Motive Division, Lima-Westinghouse, Baldwin-Westinghouse and Fairbanks, Morse-Westinghouse—detail the electrical and control equipment separately for these locomotives. The electrical components are described in detail in the first part of each section dealing with a specific builder and the second part is devoted to the control problem met in the specific locomotive being described.

As with the mechanical book, no attempt is made to show any of the electrical equipment of one locomotive in comparison with any other. The information has been checked by the builders for accuracy and completeness of detail. There has been no attempt to offer actual operating instructions, as contrary to good railroad practice, but the information in the general chapters should indicate the reasons for certain specific operating instructions.

NEW DEVICES



Aluminum Housing Track Jack

An aluminum housing which permits a 25 per cent weight reduction is the outstanding feature of the illustrated model 517-BA track jack made by the Duff Norton Mfg. Company, Pittsburgh 30, Pa. Designed for ease in spotting and carrying, this device is light enough to allow section gangs to keep pace with the fast, modern equipment used in surfacing, tamping and aligning operations.

Its base casting is of a special aluminum alloy, but all operation parts are made of heat-treated high carbon steel. A thumb guard prevents injury in tripping, and both upper and lower pawls are spring actuated to prevent accidental tripping. Carrying and spotting are simplified by a bail type handle.

The jack will raise a 15-ton load 5 in. The toe is exceptionally broad, 2½ x 3 in. to keep it from cutting into the ties when a load is applied to the track. The rack measures 1⅝ in. square which is ⅛ in. larger than conventional racks.

Crankcase Oil Tester

According to the Photovolt Corp., New York 16, the Photoelectric Crankcase Oil Tester, Model 75 is the first instrument of its kind permitting definite readings of oil contamination as an indication for the necessity of changing crankcase oil of internal combustion engines.

A few drops of oil from the dripstick are sufficient for the test which can be carried out in less than a minute. Measurements are based on the action of a source of light upon a self-generating photo-cell of the dry-disc type. For operation, the tester can be connected either to an a.c. power line or to a standard 6-volt storage battery.

A handle on the housing makes it convenient to carry the unit which weighs only 9 lb. The photocell is molded and hermetically sealed into polymerized plastic and can be relied upon to give service under unfavorable conditions of atmospheric moisture and chemical vapors.

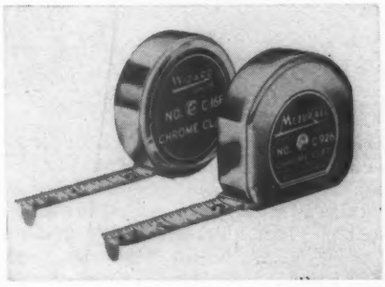
The only part which requires replacement is the lamp which is easily accessible from the bottom of the unit.

Supercharger Test Apparatus

A development recently put into operation at the Cooper-Bessemer Corp., Mt. Vernon, Ohio, plant, now makes possible complete performance tests of each exhaust-driven supercharger prior to installation on its engine. By means of this unique testing apparatus, each Cooper-Bessemer supercharger is performance-run under conditions of loads and temperatures well in excess of those on the engine for which it has been built.

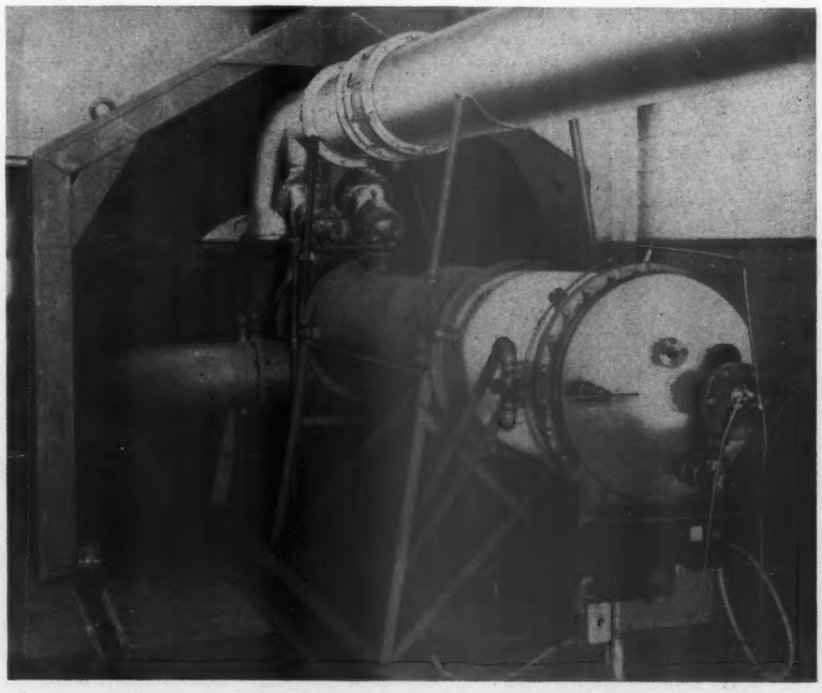
The new rig makes provision for each supercharger to propel itself. In operation, air discharged from the supercharger's centrifugal compressor is directed through an oil fire combustion chamber. The heated air is then piped through the supercharger's gas turbine, driving in turn the same centrifugal compressor unit before being discharged into the atmosphere. Variations in load are, of course, determined by the amount of air discharged from the centrifugal compressor. Temperature is governed by the rate of combustion in the heating chamber.

Installed in its own experimental building this "boot strap" equipment has complete facilities for remote control operation. Seated at the control panel in an adjoining room with visual and recording instruments, the operator can see at a glance the progress of each test.



Chrome Plated Steel Tape Rules

The blades of these tape rules, made by the Lufkin Rule Company, Saginaw, Mich., below the surface, protected against wear These Chrome-Clad, satin-finish blades absorb disturbing light reflections and afford easy reading of all markings and graduations. The blades or measuring device in black markings stand out sharply against the hard, smooth chrome-white surface and they are bonded to the steel and sunk the illustrated tape rules are now part of the Mezurall and Wizard Jr. units. Its are 100 per cent metal, will not chip, crack



or peel and are rust resistant. Balanced construction holds the blades at any length withdrawn and are held in the case by a stop catch guarding against breakage when not in use. Blades are replaceable and have a detaching device that permits replacement in a matter of seconds. Self adjusting end hooks on the rule have an automatic sliding action affording accurate butt-end and hooked-over measurements.

The heavily plated cases for the rules have flush inset side plates in attractive red and white colors.

Control of Insect Infestation in Box Cars

Studies have revealed that the primary source of infestation of food products in box cars is from insects that harbor in accumulations of grain and other organic food materials which accumulate in inaccessible places behind the inner wood wall linings. A method of infestation control in box cars has been developed by Frank S. Bishop, Minneapolis, Minn., in collaboration with a milling company and a railroad company. This system alleviates the infestation by filling the voids behind the inner linings with Fiberglas blankets.

From three to six compartments are formed behind the end lining by the horizontal corrugations in the steel ends, the furring strips and the vertical tongue-and-groove lining boards. Grains or organic dust which gets into these compartments through cracks or small breaks cannot be removed by any cleaning method. No means of eliminating the insect populations harbored and fed by these accumulations has been found.

Many box cars are built with the horizontal bottom board left out of the side lining of the car. This permits grain and other organic material which seeps into the space behind these linings to settle out onto the car floor by gravity. Even with these channels open, however, it is possible for accumulations of grain particles and dust to become caked in the side walls so that they cannot be broken up by hammering the inner lining.

The first step—applying a thick coat of asphalt emulsion to the corrugated-steel ends to prevent rust

The Fiberglas wool blankets are held by large-head nails

Installing the wood lining in the conventional manner

In applying the Bishop System to the ends of a box car the inside surfaces of the steel ends and furring strips are first painted with an asphalt emulsion to protect these areas from moisture. Blankets of Fiberglas wool 2 in. thick, 24 in. wide and as long as the width of the car are then nailed to the furring strips to hold them in place until the wood lining boards have been installed. The lining compresses the wool firmly into all voids in the spaces behind the linings. A similar method is employed in applying the Fiberglas in the side walls of the car.

Installation of the Bishop system in the two ends of a car requires approximately one man hour on the part of two carpenters, and about 180 sq. ft. of Fiberglas wool. The material and labor required to install the Fiberglas in the side walls of the car depends upon the size of the car.

Two tests have been conducted which illustrate the inability of insects to propagate in or to migrate through Fiberglas wool. In one, a layer of infested flour was placed in the bottom of a beaker and separated from a top layer of clean, uncontaminated flour by compressed 2-in. thickness of Fiberglas wool. The insects did not penetrate the wool and the top layer of flour remained uncontaminated after the beaker had stood for months under conditions ideal for propagation.

In the other test a trial installation of the Bishop system was made in the ends of a car in 1947. The side walls were left untreated. After approximately three years of service, during which time the car had traveled to all sections of the country, the end and side linings were removed and the contents of the walls examined in the biological laboratory of a flour mill. The ends of the car, protected by the Bishop System, were found to be free of all forms of infestation. Bottom boards of the untreated sides were removed and large accumulations of grains and organic matter were found. Analysis of this material showed that it contained many live insects which had propagated for several generations.

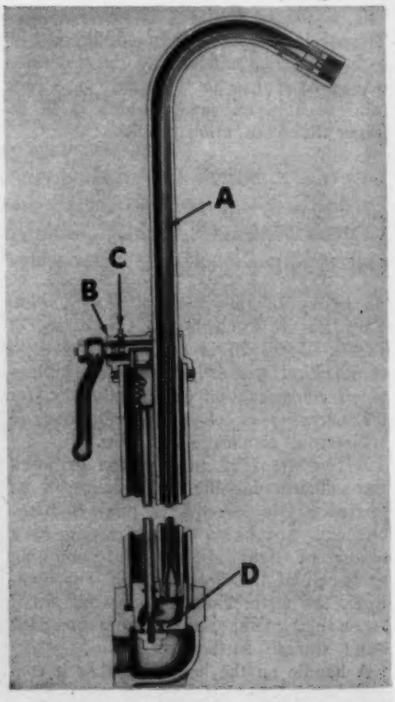
Information relative to the Bishop System of infestation control in box cars may be obtained from Department T, Owens-Corning Fiberglas Corporation, Toledo 1.

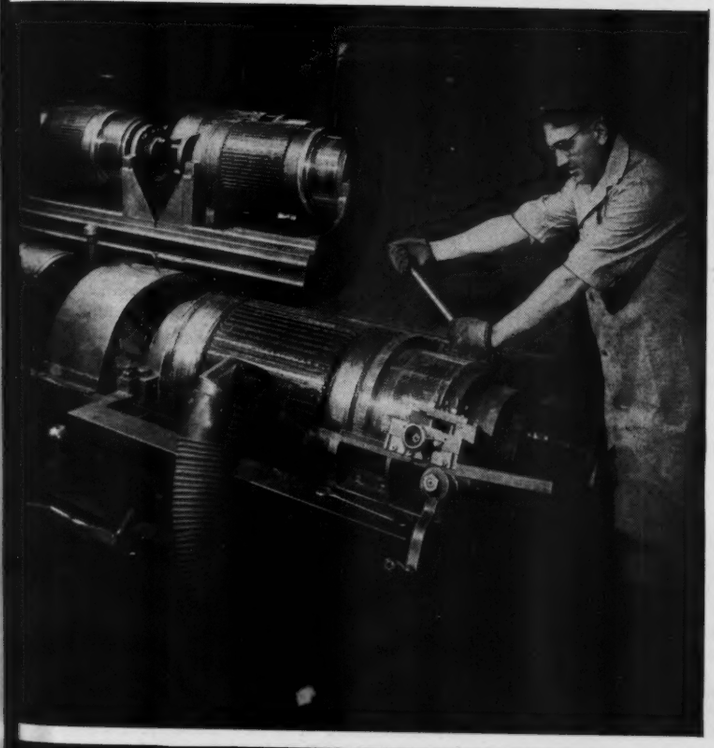
Frostproof Sanitary Water Hydrant

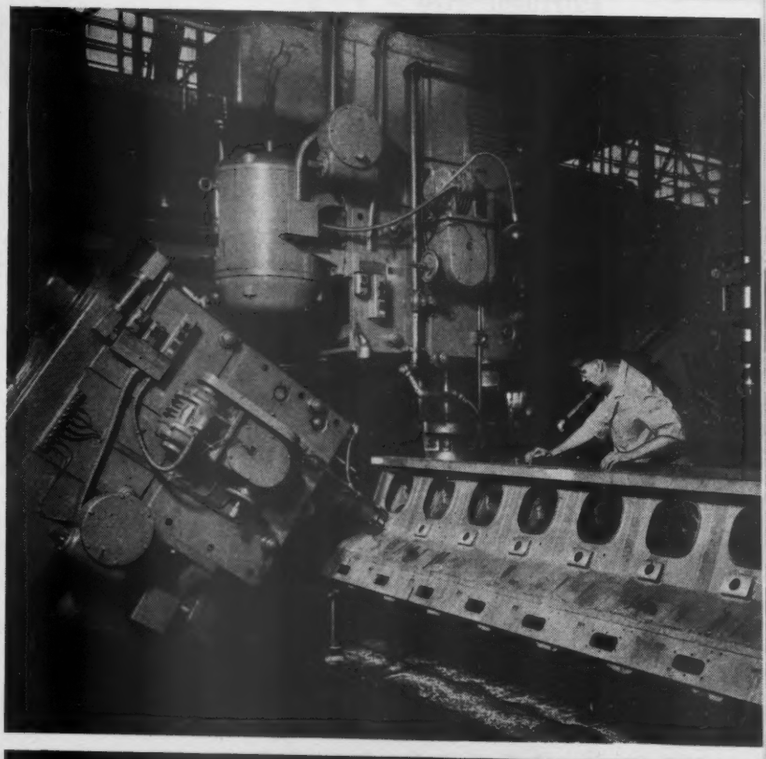
Several design changes have been made in the illustrated water hydrant recently introduced by the Crane Company, Chicago 5. Like its predecessor, the new model features a de-icing tube (A) which eliminates the need for an underground run-off. This tube contracts when the hydrant is not in use and permits only a small amount of water to remain in the spout. Under freezing conditions, this forms a thin ribbon of ice.

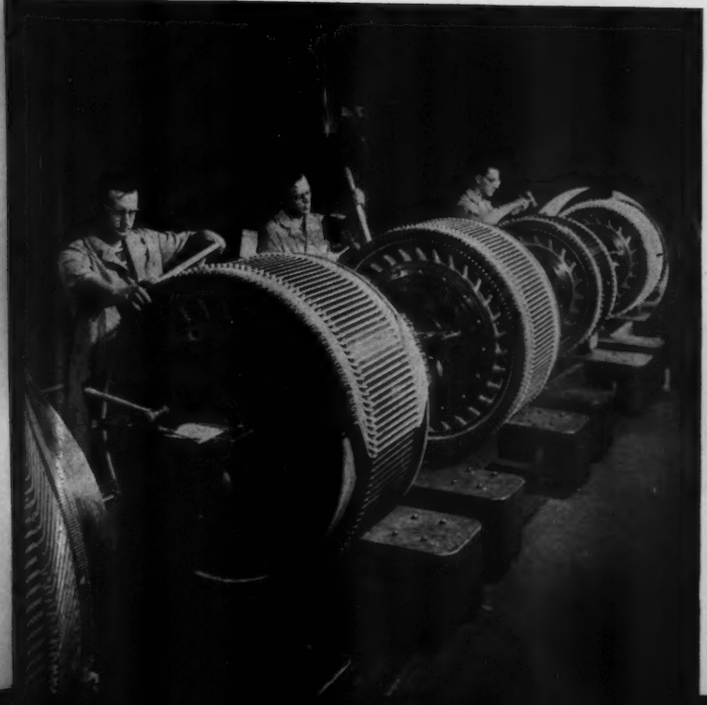
When the operating valve is again opened, incoming water pressure quickly expands the tube away from the ice and forces water around it. This action breaks up the ice and ejects it through the spout. Another

(Continued on page 90)









feature is a rubber tubing which gives greater water capacity and eliminates the possibility of leakage at spout inlet.

The entire device above and below ground, is completely sealed against entry of any polluted moisture or matter that might contaminate the water supply.

A new cap design and handle operating mechanism (B) seals out the weather. A grease fitting (C) has been added to provide a means of lubrication. The cone-shaped rubber disc (D) reduces the possibility of foreign matter being entrapped and cutting out the seating surfaces.

The improved hydrants are available for 3, 4 and 5 ft. bury. They are recommended for a working pressure of 100 lb. cold water maximum and a minimum pressure of 30 lb. down to minus 15 deg. F. or 50 lb. down to minus 40 deg. F.

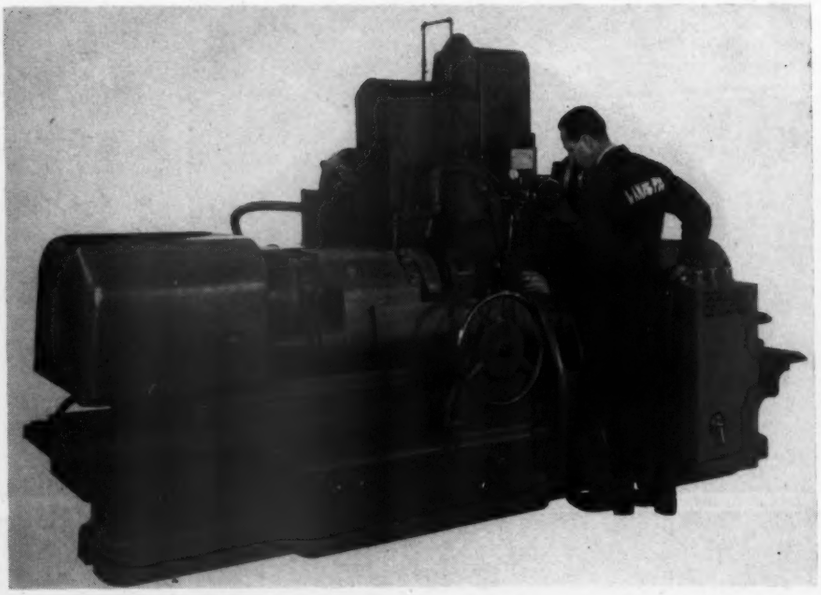
Portable Hot Air Furnace

A fully portable hot air furnace, equipped with an automatic oil burner has been introduced by the Quiet Oil Burner Corp., Newark 4, N. J. Of new design, it includes the fuel saving Catomic adjustable turbulator in the burner nozzle which produces high combustion so that no smoke stack is required.

The unit can be wheeled around from space to space or can be used permanently in one place. To operate, all that is necessary is to plug in the conductor cord to any 110 volt line, attach the hose to the oil drum, hang up the thermostat and turn on the switch.

This device is ideal for heating large spaces such as airplane hangars, railroad round houses, piers and shops. Other applications are for thawing or preheating trucks, tractors and railway rolling stock.

The furnaces are available in several sizes. All burn regular No. 2 grade fuel oil and have stainless steel combustion chambers. A hook on the top is for lifting the complete unit from floor to floor.



Crank Pin Grinding Machine

This unit, designated as the Type DH crank pin grinding machine, is available in swings of 16 or 25 in. and in lengths to accommodate 32, 42 and 72 in. crankshafts. Made by the Landis Tool Co., Waynesboro, Pa., it is used extensively for high production grinding of 4, 6 or 8 cylinder crankshafts.

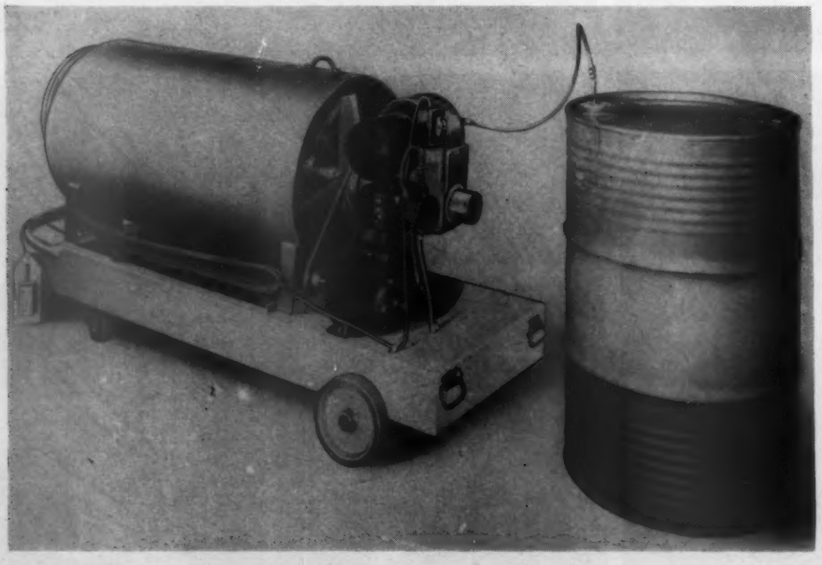
Many refinements to speed production are built into this improved model. Lubrication to the carriage and wheelbase ways is from a separate reservoir with pump and filter. A safety pressure switch prevents operation of the machine unless pressure exists in the system. The carriage ways are fully protected from dirt by telescoping covers which keep the hand-scraped ways protected regardless of the carriage position.

A sensitive hand feed for the carriage is used for positioning the crank shaft laterally as the grinding wheel moves toward the work. Facilities are provided for quick filling and emptying of its fully enclosed oil reservoir as well as gauges to show the oil level.

Speeds of the hydraulic traverse are adjustable at the front of the machine. There are separate controls for positioning speed of the carriage and for both right hand and left hand cushioning speeds.

An overhead type wheel dresser may be obtained to speed the operating cycle. This dresser is hydraulically operated and permits dressing the wheel without changing the work set-up.

A variable speed motor to maintain correct surface speed of the wheel regardless of wheel diameter is available. Automatic sizing is optional equipment.



Transformer Welder

Air Reduction Sales Company, 60 East 42nd street, New York 17, has announced the availability of a new 200-amp. transformer welder. Called the Airco 200-Amp. Model MCX Transformer Welder, it is the latest development in the Wilson line. It is 12 in. by 17 in. by 23 in. high, and is designed to cover a wide range of applications from light duty sheet metal jobs to heavy duty industrial work. It has a full 200-amp., 50 per cent duty cycle, N.E.M.A. rating. Three current ranges selected by insulated tapered plug connectors and hand crank adjustments within each range provide currents from 30 to 250 amp. This permits the use of 1/16-in. to 3/16-in. diameter electrodes. Silicone insulation permits high temperature operation and is water repellant.

This welder employs an automatic hot start control with a hermetically sealed gas-filled, time-delay relay magnetic switch that has no open contact. It is of simple

(*Continued on page 120*)

"YOU BUY 1 BOX . . . OR 10,000 BOXES . . .
AT THE SAME LOW FLAT PRICE PER BRUSH!"

BECAUSE WE'VE STANDARDIZED NATIONAL TRADE-MARK CARBON BRUSHES

FOR DIESEL-ELECTRIC LOCOMOTIVE EQUIPMENT!

YOU PAY the same low, flat price regardless of how many brushes you buy, providing you buy one box or multiple thereof. You get fast delivery because these brushes are kept in stock in large supply. You get better quality because of manufacturing refinements made possible by mass production economies. You get a brand new package — sturdy, attractive, easy to store and handle.

Why is this possible? Because we have STANDARDIZED "NATIONAL" brushes for all motors and generators commonly used on diesel-electric locomotives. We have picked the best brushes in the field for dependable operation under severe and varying conditions. We have made them with top performance grades and still stronger connections — made them better in many ways — and we are now making these brushes in quantity. The list of STANDARDIZED diesel-electric brushes follows:

BRUSH NO.	SIZE (INCHES)	GRADE
	FOR TRACTION MOTORS	
NC 24-7215	2 x 2¼ x ¾ (⅜-⅝)	"Plytek" Grade AZY
NC 24-7213	2 x 2¼ x ¾ (⅜-⅝)	"Plytek" Grade AX-5
NC 24-5620	2 x 1¾ x ¾ (⅜-⅝)	"Plytek" Grade AZY
NC 24-5619	2 x 1¾ x ¾	Grade AX-5
NC 20-6420	2⅛ x 2 x ⅝ (1/16-1/16)	"Plytek" Grade AZY
NC 20-6419	2⅛ x 2 x ⅝ (1/16-1/16)	"Plytek" Grade AJH
NC 32-5204	2¼ x 1⅝ x 1	Grade AX-5
	FOR MAIN GENERATORS	
NC 24-4024	2½ x 1¼ x ¾ (⅜-⅝)	"Plytek" Grade 255
NC 24-4009	2½ x 1¼ x ¾ (⅜-⅝)	"Plytek" Grade SA-45
NC 12-4819	2¼ x 1½ x ⅜	Grade SA-35 (30/30 Bevel)
NC 20-4202	2 1/16 x 1 1/16 x ⅝ (1/16-1/16)	"Plytek" Grade SA-3590
NC 20-5633	2¼ x 1¾ x ⅝ (1/16-1/16)	"Plytek" Grade SA-3590
NC 12-4812		
NC 12-4813	2¼ x 1½ x ⅜	Grade SA-35 (35/10 & 35/30 Bevels)
NC 13-5101	2¼ x 1.580 x .400	Grade AX-5
	FOR AUXILIARY EQUIPMENT	
NC 20-3220	2 x 1 x ⅝	Grade 259
NC 16-3220	1¾ x 1 x ½	Grade SA-3538
NC 16-5622	1¾ x 1¾ x ½	Grade 259
NC 08-3216	1¾ x 1 x ¼	Grade SA-45

The terms "National", "Plytek" and the Three Pyramids Device are registered trade-marks of

NATIONAL CARBON COMPANY • **Division of Union Carbide and Carbon Corporation**

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NEWS

Allied Railway Supply Exhibit

TENTATIVE arrangements are being made by the Allied Railway Supply Association, for holding exhibits during the meeting of the Coordinated Mechanicl Associations at the Sherman Hotel, Chicago, September 17 to 20. The Electrical Section, A.A.R., will meet at the same time at the La Salle Hotel. Details concerning the exhibit may be had by writing to the secretary of the supply association, P.O. Box 5522, Chicago 80.

May Locomotive and Car Programs

THE National Production Authority has approved allocations, including 36,600 tons of steel, for locomotive building and 288,500 tons for freight cars in May. The program contemplates a May production of about 300 locomotives.

The freight car program, which has been on a 10,000-car monthly basis since it was inaugurated in January, will become a 9,000-car program in May. The N.P.A. has advised participating steel producers that May allocations for the program will total 288,500 tons of steel. This compares with monthly allocations of 310,000 tons during this year's first four months. It is understood that the Defense Transport Administration is undertaking to have the cut restored.

Samuel R. Lewis Receives Anderson Medal

SAMUEL R. LEWIS, consulting mechanical engineer of Chicago, and the author of several textbooks on engineering as well as of numerous technical papers and engineering articles, including "Railway Air Conditioning" and "Air Conditioning and Refrigeration," has been awarded the 1950 F. Paul Anderson Medal of the American Society of Heating and Ventilating Engineers for "outstanding contributions to the advancement of heating, ventilating and air conditioning."

Bureau of Safety Report

THE annual report of Director S. N. Mills of the Interstate Commerce Commission's Bureau of Safety for the fiscal year ended June 30, 1950, has been submitted to the commission and sets forth in the usual form the results of inspection of safety-appliance equipment on railroads, together with information on hours of service of railroad employees, installation and inspection of signal systems, interlocking and automatic train-stop and train-control devices, investigation of accidents, prosecutions for violations of railroad safety laws and other activities of the bureau.

During the year under review, 1,149,879 freight cars, 29,533 passenger-train cars and 12,647 locomotives were inspected, as compared with 1,072,219 freight cars, 27,481 passenger-train cars and 12,044 locomotives in fiscal 1949. Of the 1950 total, 3.37 per

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE MARCH ISSUE

DIESEL-LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Akron & Barberton Belt	1	1,200	Switch	Baldwin-Lima-Hamilton
Calumet & Hecla Consolidated Copper Co.	1	1,200	Switch	Baldwin-Lima-Hamilton
Kansas City Southern	4	1,200	Switch	Baldwin-Lima-Hamilton
Louisville & Nashville	10[1]	1,500	Road	Electro-Motive
	31[1]	1,500	Freight	Electro-Motive
	12['A'B']	1,500	Freight	Electro-Motive
	4[1]	1,500	General purpose	Electro-Motive
	10[1]	1,200	Switch	Electro-Motive
Rutland	5[3]	1,600	Road-switch	Alco-G. E.
New York Central	22['A']	2,250	Passenger	Electro-Motive
	131['A']	1,500	Freight	Electro-Motive
	7['B']	1,500	Freight	Electro-Motive
	27	1,500	Road switch	Electro-Motive
	11	1,200	Switch	Electro-Motive
	6	800	Switch	Electro-Motive
	62['A']	1,600	Freight	Alco-G. E.
	32['B']	1,600	Freight	Alco-G. E.
	27	1,600	Road switch	Alco-G. E.
	13	600	Switch	Alco-G. E.
	8['A']	2,400	Passenger	Fairbanks, Morse
	4['B']	1,600	Freight	Fairbanks, Morse
	8['A']	1,600	Freight	Fairbanks, Morse
	18['A']	1,600	Freight	Baldwin-Lima-Hamilton
	8['B']	1,600	Freight	Baldwin-Lima-Hamilton
	3	1,200	Switch	Baldwin-Lima-Hamilton
Canadian National	12	800	Switch	General Motors Diesel, Ltd.
	12	660	Switch	Montreal Loco. Wks.
Sharon Steel Corp.	8	800	Switch	Baldwin-Lima-Hamilton
	1	1,200	Switch	Baldwin-Lima-Hamilton
Wabash	2	1,200	Switch	Baldwin-Lima-Hamilton

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atchison, Topeka & Santa Fe	500	70-ton gondola	Company shops
Atlanta & West Point	90	50-ton box	Pullman-Standard
Cambria & Indiana	400	50-ton hopper	Bethlehem Steel
Canadian National	50[2]	Box	Eastern Car Co.
	1,500[2]	70-ton gondola	Eastern Car Co.
	500[2]	70-ton hopper	National Steel Car Corp.
	300[2]	50-ton flat	National Steel Car Corp
Chattahoochee Valley	10	50-ton pulpwood	Company shops
Chesapeake & Ohio	200[4]	70-ton covered hopper	Pullman-Standard
Chicago & Eastern Illinois	100	50-ton box	American Car & Fdry.
Duluth, Missabe & Iron Range	1,500	70-ton ore	Pullman-Standard
Erie	500	70-ton gondola	Greenville Steel Car
	500	50-ton box	Company shops
Georgia	110	50-ton box	Pullman-Standard
	100	50-ton hopper	Pullman-Standard
Illinois Terminal	25[5]	70-ton gondola	Greenville Steel Car
Merchants Despatch Transportation Corp.	1,000	40-ton refrigerator	Company shops
Richmond, Fredericksburg & Potomac	100	50-ton box	Pullman-Standard
Western of Alabama	50	50-ton gondola	Pullman-Standard

FREIGHT-CAR INQUIRIES

Great Northern	700-1,000	70-ton ore	
Northern Pacific	250	70-ton gondola	
Western Maryland	1,000	55-ton hopper	

PASSENGER-CAR INQUIRIES

Road	*No. of cars*	*Type of car*	*Builder*
Chicago, Burlington & Quincy; Denver & Rio Grande Western; Western Pacific	22[6]	Sleeping	

[1] For delivery by October, except the general-purpose locomotives which are expected to be delivered in January, 1952.

[2] Estimated cost $750,000. Two units delivered. Delivery of a third expected in April, and the remaining two in June.

[3] Delivery of the box cars scheduled for the latter part of this year. Delivery of the other cars to begin in December.

[4] Delivery scheduled for 1952. Estimated cost $1,400,000.

[5] For delivery early next year.

[6] Equipment includes 12 6-section-6-roomette-4-double bedroom cars, six 6-double bedroom-5-compartment cars (three for the Burlington, two for the W. P. and one for the D. & R. G. two 6-double bedroom-10 roomette and one dome-room-observation car and one 16-section car, all of stainless steel.

NOTES:

Southern Pacific.—The S. P. has authorized purchase of 5,500 box, 1,000 gondola and 500 hopper cars.

Pittsburgh's Alkali and Acid-Resistant

CARHIDE...

Provides better protection and longer life for covered hopper cars!

● One of the hundred covered hopper cars refinished with alkali- and acid-resisting CARHIDE in use for more than a year by the Rock Island Lines.

YOU can now give added years of service to covered hopper, refrigerator and tank cars with Pittsburgh's alkali- and acid-resisting CARHIDE.

● **This new product** of Pittsburgh's leadership in paint research now makes possible an entirely new degree of protection against the effects of cargoes which quickly destroy ordinary finishes.

● **A number** of leading railroad lines have tested this finish on several hundred cars for periods from one to three years with highly satisfactory results. Tests have demonstrated that such ladings as soda ash, sulphur, phosphates, cement, lime, common salt, alkalis, crude oil and alcohol will not affect it. Furthermore, it has shown high resistance to abrasion as well as to repeated scrubbings.

● **This new CARHIDE** dries as quickly as lacquer—you can maintain one-day finishing schedules.

● **If your line** has cars used to carry corrosive cargoes it will pay you to investigate this new alkali- and acid-resistant CARHIDE. Call on us for suggestions and advisory service.

PITTSBURGH PLATE GLASS COMPANY
Industrial Paint Division, Pittsburgh, Pa.

Factories: Milwaukee, Wis.; Newark, N. J.; Springdale, Pa.; Houston, Texas; Los Angeles, Calif.; Portland, Ore. Ditzler Color Division, Detroit, Mich. The Thresher Paint & Varnish Co., Dayton, Ohio. Forbes Finishes Div., Cleveland, Ohio. M. B. Suydam Div., Pittsburgh, Pa.

Pittsburgh Railway Finishes For Every Need

CARHIDE—for wood and metal freight cars of all types.

LAVAX SYNTHETIC ENAMELS—for locomotive and passenger cars.

STATIONHIDE—adds beauty and attractiveness to stations.

IRONHIDE—for iron and steel fixed properties.

SNOLITE—white fume-proof paint for signs, crossing gates, fences and cattle guards.

PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

cent of the freight cars, 3.74 per cent of the passenger-train cars and 3.41 per cent of the locomotives were found to be defective, as compared to the respective 1949 figures of 3.21 per cent, 3.28 per cent and 4.12 per cent.

Air brakes tested on 2,826 trains (consisting of 124,708 cars) prepared for departure from terminals were found operative on 124,576 cars, or 99.9 per cent. This percentage was attained, however, after 2,364 cars having defective brakes had been set out and repairs had been made to brakes on 2,045 cars remaining in the trains. Similar tests on 1,530 trains arriving at terminals with 85,135 cars showed that air brakes were operative on 97.8 per cent of the cars and that an average of approximately 1.2 cars per train were not controlled by power brakes.

According to the report, 703 reporting railroads and private car lines, which collectively own 2,152,320 freight cars, have equipped 1,907,812 such cars with power brakes which comply with specifications set out in the commission's September 21, 1945, order, as amended August 27, 1948, October 10, 1949, and October 10, 1950.

As of June 30, 1950, 89.8 per cent of railroad-owned cars, and 80.5 per cent of cars owned by private car lines, were equipped. In the matter of geared hand brakes, the report noted that the Association of American Railroads has issued certificate of approval for 28 types—15 vertical wheel types, 10 horizontal wheel types, and 3 lever types.

Rules for Self-Propelled Cars Will Be Considered

THE Interstate Commerce Commission has instituted an investigation "to determine what, if any, rules and instructions should be prescribed for the inspection and testing of self-propelled units of equipment . . . in multiple-unit service operated by a single set of controls." All Class I railroads have been made respondents in the proceeding which is docketed as Ex Parte No. 179.

Petitions asking that present locomotive inspection rules be extended to include multiple-unit cars were filed with the commission recently by the Brotherhood of Locomotive Engineers and the Brotherhood of Locomotive Firemen and Enginemen. (See *Railway Mechanical and Electrical Engineer*, March 9, page 90.)

Miscellaneous Publications

SYMPOSIUM ON RAPID METHODS FOR THE IDENTIFICATION OF METALS.—American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. 84-page publication (STP No. 98), bound in heavy paper. Price, $1.75. This symposium, sponsored by Committee E-3 on Chemical Analysis of Metals, covers the most recent developments in the field of rapid methods for the identification of metals. It comprises nine papers as follows: Development, Present State, and Outlook of Spot Test Analysis, by Feigl, Laboratorio da Producao Mineral, Ministerior da Agricultura, Rio de Janeiro, Brazil; Electro Spot Testing and Electrography, by H. W. Hermance and H. V. Wadlow, Bell Telephone Laboratories; Instruments for Rapid Metal Identification, by R. R. Webster, Jones & Laughlin Steel Corporation; Separating Alloys by Relative Spot Tests, by H. Kirtchik, General Electric Company; Rapid Methods for the Identification of Copper-Base Alloys, by R. P. Nevers, American Brass Company; Rapid Identification of Metal Finishes, by A. Lewis and D. R. Evans, Western Electric Company; Examination of Plated and Protective Coatings by Electrographic Analysis, by N. Galitzine and S. E. Q. Ashley, General Electric Company; A Field Test Kit and Procedure for Use in the Rapid Identification of Some Nickel Alloys and Stainless Steels, by H. B. Lea, Eastman Kodak Company, and Rapid Tests for Identifying Alloy Steels, by E. C. Kirkham, University of Utah.

◆

TYPES OF LOCKNUTS AND THEIR PRINCIPLES OF OPERATION. Published by Locknut Section, Industrial Fasteners Institute, Cleveland, Ohio. 18-page, illustrated paper-covered booklet. Discusses the advance of the locknut during the past decade, and briefly describes various types of modern locknuts and their principle of operation.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of November 1950	Month of November 1949	11 months ended with November 1950	11 months ended with November 1949
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	29,011	29,566	317,821	361,164
3-06	Total, Diesel-electric	19,271	14,401	191,774	137,893
3-07	Total, electric	798	756	9,087	8,733
3-04	Total, locomotive-miles	49,089	44,726	518,749	507,814
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,696	1,466	17,924	16,419
4-06	Empty, total	868	812	9,327	9,285
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	48,415	45,847	530,458	566,323
6-02	Total in oil-burning steam locomotive trains	13,425	13,816	141,809	163,594
6-03	Total in Diesel-electric locomotive trains	53,928	40,178	543,846	393,604
6-04	Total in electric locomotive trains	2,158	2,029	24,229	23,443
6-06	Total in all trains	117,966	101,886	1,240,644	1,147,092
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.05	1.05	1.05	1.05
10-02	Loaded freight car-miles	38.40	36.70	38.60	36.30
10-03	Empty freight car-miles	19.70	20.30	10.10	20.60
10-04	Total freight car-miles (excluding caboose)	58.10	57.00	58.70	56.90
10-05	Gross ton-miles (excluding locomotive and tender)	2,673	2,550	2,673	2,537
10-06	Net ton-miles	1,242	1,152	1,224	1,141
12	Net ton-miles per loaded car-mile (M-211)	32.30	31.40	31.70	31.40
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	66.10	64.40	65.80	63.90
14	Averages per train hour (M-211):				
14-01	Train miles	16.70	16.90	16.90	16.90
14-02	Gross ton-miles (excluding locomotive and tender)	43,949	42,558	44,471	42,377
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	46.40	42.20	45.30	41.90
14-02	All	44.00	39.30	42.50	39.40
15	Average net ton-miles per freight car-day (M-240)	941	793	885	791
17	Per cent of home cars of total freight cars on the line (M-240)	37.00	45.40	41.30	50.00

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	11,310	12,067	128,382	169,823
3-06	Diesel-electric	15,062	13,380	160,774	139,200
3-07	Electric	1,572	1,569	17,605	18,111
3-04	Total	27,945	27,016	306,762	327,248
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	269,256	261,018	2,955,677	3,072,231
4-09	Total in coal-burning steam locomotive trains	61,442	62,862	666,196	888,676
4-10	Total in oil-burning steam locomotive trains	34,474	37,966	403,440	479,619
4-11	Total in Diesel-electric locomotive trains	156,442	142,697	1,696,601	1,505,499
12	Total car-miles per train-miles	9.47	9.38	9.44	9.19

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,435	1,365	15,664	19,035
1-02	Steam, oil-burning	279	256	2,757	3,021
1-03	Diesel-electric[1]	2,752	2,085	27,591	21,785
1-06	Total	4,494	3,731	46,314	44,128
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	53	70	634	983
2-02	Steam, oil-burning	15	13	149	168
2-03	Diesel-electric[1]	237	219	2,515	2,295
2-06	Total	339	337	3,673	3,832
3	Hours per yard locomotive-day:				
3-01	Steam	8.80	7.20	8.10	8.10
3-02	Diesel-electric	18.00	16.90	17.50	17.10
3-05	Serviceable	14.80	13.60	14.20	13.30
3-06	All locomotives (serviceable, unserviceable and stored)	12.90	10.80	12.00	11.10
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.84	1.78	1.79	1.86
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.78	0.80	0.77	0.77

[1] Excludes B and trailing A units.

for an XL Ride THAT Protects LADING AND ELIMINATES DAMAGE CLAIMS

THE New MINER XL Ride Snubber CLASS C-4-S

W. H. MINER, INC., CHICAGO

SUPPLY TRADE NOTES

TURCO PRODUCTS, INC.—*D. T. Buist* has been appointed national sales director of Turco Products, Inc., to succeed *Lou H.*

L. H. Moulton

Moulton, vice-president and national sales director, who recently retired. *Stewart B. Van Dyne* has been appointed administrative assistant and *D. T. Miller* as coordinator of sales, both newly created positions.

Mr. Buist joined Turco in 1936 after 20

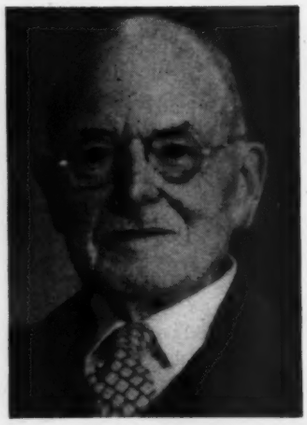
D. T. Buist

years of experience in the automotive field, and has worked successively as service engineer, district sales manager, western zones sales manager, and, most recently, as assistant national sales director.

◆

SIMMONS-BOARDMAN PUBLISHING CORPORATION.—*Robert C. Augur*, consulting editor, Locomotive Cyclopedia and Car Builders' Cyclopedia—publications of the Simmons-Boardman Publishing Corporation—has retired. Mr. Augar was born on June 24, 1866, at New Haven, Conn. He attended Hillhouse High School, New Haven, and is a graduate of Sheffield Scientific

School, Yale University (1887). He entered railroad service as a special apprentice in the test department of the Chicago, Burlington & Quincy at Aurora, Ill., in 1887 and later became assistant enginehouse foreman. From 1890 until 1905 he was assistant mechanical engineer and chief engineer of the New York Air Brake Company at Watertown, N. Y. In the latter year he became resident engineer of the Westinghouse Air Brake Company at Wilmerding, Pa., and in 1910, engineer of tests for the American Brake Shoe Company. In 1917 Mr. August was appointed director of inspection for the Westinghouse Electric & Manufacturing Co. at Philadel-



R. C. Augur

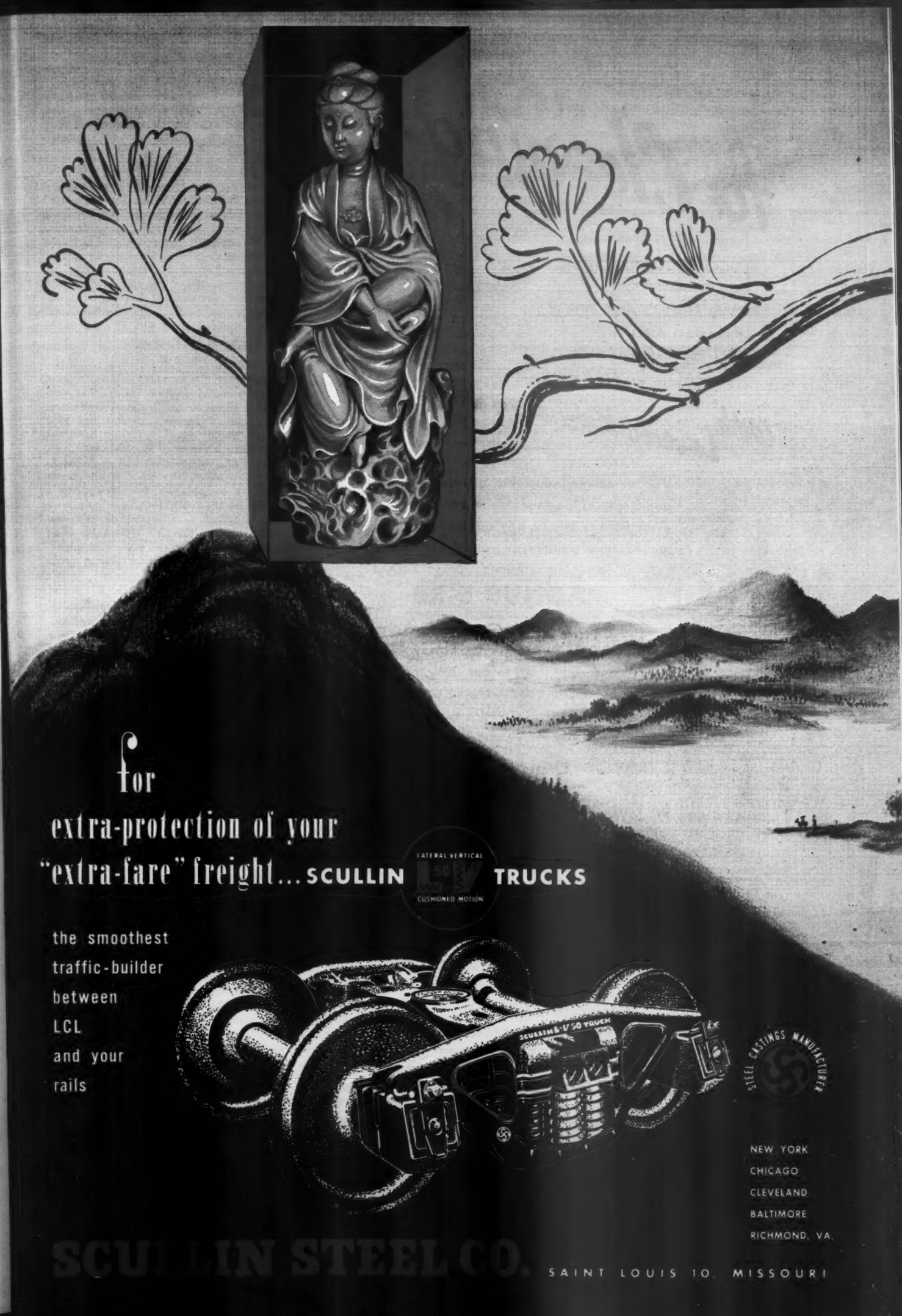
phia, Pa., and in 1919 installation engineer, propelling machinery for the Federal Shipbuilding Company. He became managing editor of the Locomotive Car Builders' Cyclopedia in 1920 and consulting editor in 1948.

◆

JOHNS-MANVILLE CORPORATION.—Leslie *M. Cassidy*, formerly president of the Johns-Manville Corporation, has been elected chairman of the board and chief executive officer to replace *Lewis H. Brown*, deceased. *Adrain R. Fisher*, formerly vice-president in charge of all asbestos mining, has been elected president, succeeding Mr. Cassidy.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—The following have been elected vice-presidents of the Westinghouse Electric Corporation: *Tomlinson Fort*, manager of apparatus sales department at Pittsburgh, Pa.; *L. W. McLeod*, southwestern district manager at St. Louis, Mo.; *Emery W. Loomis*, middle Atlantic district manager at Philadelphia, Pa., and *L. E. Lynde*, New England district manager at Boston, Mass., who will now head the company's Washington, D. C., government office. *L. D. Rigdon*, manager of the Headquarters Manufacturing division, has been appointed assistant to vice-president in charge of manufacturing. *C. G. Wallis*, director of Headquarters Manufacturing Engineering department, succeeds Mr. Rigdon as manager of the Headquarters Manufacturing division. *Robin S. Kersh*,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extra-protection of your
"extra-fare" freight... SCULLIN TRUCKS
LATERAL VERTICAL
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CUSHIONED MOTION
the smoothest
traffic-builder
between
LCL
and your
rails
SCULLIN-V 50 TRUCK
STEEL CASTINGS MANUFACTURER
NEW YORK
CHICAGO
CLEVELAND
BALTIMORE
RICHMOND, VA.
SCULLIN STEEL CO.
SAINT LOUIS 10, MISSOURI

formerly manager of central station sales, has been appointed manager of the company's Steam division at South Philadelphia, Pa.

◆

JOURNAL BOX SERVICING CORPORATION.—*James E. McNamara* has been appointed vice-president of the Journal Box Servicing Corporation, Indianapolis, Ind. Mr. McNamara recently resigned as vice-president of reclamation for Peerless Equipment Company. *Thomas W. Potter*, formerly special representative for the Journal Box Servicing Corporation, has become vice-president—operation. Mr. Potter will maintain his offices jointly with Mr. McNamara at 332 South Michigan avenue, Chicago.

◆

AEROQUIP CORPORATION.—The Aeroquip Corporation of Jackson, Mich., has purchased all the outstanding stock of *Metalco, Inc.*, also of Jackson. Metalco has been a substantial subcontractor of Aeroquip, furnishing a variety of special hose fittings, tube bends, and elbows used in Aeroquip hose assemblies. Operation of the newly acquired company will be continued as a wholly owned subsidiary of Aeroquip, with *Don Mortlock* as vice-president and general manager. *Kenneth Meyerholtz*, chief production engineer and plant superintendent of Aeroquip, has been elected president of Metalco.

◆

BALDWIN-LIMA-HAMILTON CORPORATION.—The office of the Baldwin-Lima-Hamilton Corporation at 120 Broadway, New York 5, has been discontinued and all sales activities in the New York area are now coordinated in the company's offices at 60 East 42nd street, New York 17.

◆

PYLE-NATIONAL COMPANY.—*Charles H. Hobbs* has been appointed a district manager of the Pyle-National Company, with headquarters in St. Louis, Mo. Mr. Hobbs will handle both railroad and industrial business for the company in Misouri, Kansas, Arkansas, southern Illinois and southern Indiana.

Pyle-National has completed construction of two new additions and building changes to its main manufacturing plant in Chicago. The new additions total 28,000 sq. ft. of floor space and will substantially increase manufacturing, maintenance and warehousing operations of the company.

◆

AMERICAN OPTICAL COMPANY.—*John T. Monahan* has been appointed assistant sales manager of the Safety Products division of the American Optical Company, Southbridge, Mass.

◆

PEERLESS EQUIPMENT COMPANY.—*William E. Gray*, first vice-president of the Peerless Equipment Company, a subsidiary of Poor & Co., has been elected president, succeeeding the late David W. Lamoreaux, deceased.

Mr. Gray received his primary and high school education at Pittsburgt, Pa., and is a graduate of Purdue University in mechanical engineering (1923). After graduation he taught mechanical engineer-

DUCTILE IRON

A Revolutionary Metallurgical Development

DUCTILE IRON is a cast ferrous product which combines the *process advantages* of cast iron with many of the *product advantages* of cast steel.

No longer in the pilot-plant stage, this new material is now produced and sold on the basis of specifications. Not only are its individual properties exceptional, but no other common engineering material provides such a combination of excellent castability and fluidity, with high strength, toughness, wear resistance, and machinability.

Actually, "ductile iron" denotes not a *single* product, but rather a family of ferrous materials characterized by graphite in the form of spheroids . . . a form controlled, in a broad sense, by small amounts of magnesium. Presence of spheroidal rather than flake graphite gives this new product a ductility that is unique among gray cast irons.

Four important types of ductile iron now being produced commercially are tabulated below.

REPRESENTATIVE MECHANICAL PROPERTIES OF COMMERCIAL HEATS OF DUCTILE IRON

	Grade	Tensile strength, psi	Yield strength, psi	Elongation per cent	BHN	Usual condition
A	90-65-02	95/105000	70/75000	2.5/5.5	225/265	As-cast
B	80-60-05	85/95000	65/70000	5.5/10.0	195/225	As-cast
C	60-45-15	65/75000	50/60000	17.0/23.0	140/180	Annealed
D	80-60-00	85/95000	65/75000	1.0/3.0	230/290	As-cast

A Pearlitic in structure. Provides good mechanical wear resistance.

B Pearlitic-ferritic in structure. Provides strength and toughness combined.

C A fully ferritic structure usually obtained by short anneal of either (A) or (B). Provides optimum machinability and maximum toughness.

D Higher phosphorous content than preceding grades, also higher manganese. Provides high strength and stiffness, but only moderate impact strength.

SOME UNIQUE PROPERTIES OF DUCTILE IRON

1. Its elastic modulus, about 25,000,000 psi, is virtually unaffected by composition or thickness . . .

2. It can provide a chilled, carbidic, abrasion-resistant surface supported by a tough ductile core. No other single material can combine these properties . . . its only counterpart being a tough material coated with a hard welded overlay.

3. As-cast ductile iron of 93,000 psi tensile strength has the same machinability rating as gray iron with a strength of 45,000 psi.

4. Annealed ductile iron can be machined at a rate 2 to 3 times that of good quality gray iron.

5. It can be satisfactorily welded.

APPLICATIONS

Automotive, agricultural implement, railroad and allied industries apply ductile iron, as-cast and heat treated, in components too numerous to detail.

Machinery, machine tools, crankshafts, pumps, compressors, valves and heavy industrial equipment such as rolls and rolling mill housings, utilize its high strength and rigidity.

In scores of engine, furnace and other parts serving at elevated temperatures, it provides oxidation and growth resistance heretofore unavailable in high carbon castings.

Other applications include paper, textile and electrical machinery, marine equipment, and pipe.

AVAILABILITY

Send us details of your prospective uses, so that we may offer a list of sources from some 100 authorized foundries now producing ductile cast iron under patent licenses. Request a list of available publications on ductile iron . . . mail the coupon now.

EMBLEM OF INCO SERVICE
TRADE MARK

The International Nickel Company, Inc.
Dept. RMEE, 67 Wall Street
New York 5, N. Y.

Please send me a list of publications on:

DUCTILE IRON

Name _____ Title _____

Company _____

Address _____

City _____ State _____

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5. N. Y.

ing for two years, and subsequently was placed in charge of the Draft Gear Testing Laboratory set up at Purdue by the Association of American Railroads in 1926.

William E. Gray

He remained in charge of the laboratory until October 1943, when he entered the employ of Peerless Equipment as vice-president in charge of engineering. In January 1950, he became first vice-president.

◆

RYDIN RAILWAY EQUIPMENT COMPANY.—*Carl N. Rydin*, formerly with the Chicago, Burlington & Quincy engineering department as engineer and inspector, has resigned to become president of his own

Carl N. Rydin

company, the Rydin Railway Equipment Company, with offices at the Railway Exchange, Chicago. The company will handle a line of car couplers, including a special all-purpose coupler for motor cars and trailers.

◆

AMERICAN HOIST & DERRICK CO.—*John E. Carroll*, general sales manager of the American Hoist & Derrick Co., has been elected vice-president of sales.

Mr. Carroll, a graduate of the University of Minnesota in 1937, joined American Hoist as a district representative, working successively in the Texas, Chicago and west coast territories. He resigned his sales position in 1945 to become a partner in

I'm a 50-cent dollar but, when I'm used right, I can give you a 150-cent value.

Take AMCCW chilled car wheels. My predecessor, the 100-cent dollar, used to make out pretty well with these wheels. In 1929, for instance, the AMCCW wheel averaged about 40-million car miles without failure.

But the AMCCW wheels in service during the last five years of the 1940's, after I'd been devalued, gave you 111-million car miles average per wheel failure, according to ICC reports. The figure for 1950 was close to 120-million. See what I mean about that 150-cent value?

The 50-cent dollar has a point there, thanks to the continuous improvement of the AMCCW wheel. Better foundry methods, stricter inspection, association research—all have helped to step up chilled wheel safety and performance, while loads and speeds were being increased.

Increase in Safety Performance for AMCCW wheels
(car miles without failure)

1950	120,000,000
1929	40,000,000
	80,000,000

or 200% increase

Now the heavier rim of the redesigned AMCCW wheel doubles rim strength, further increases flange strength. Thicker, heavier brackets (and more of them) give added flange support. (The new wheel is illustrated above.)

So here's the story in a nut-shell:

Although the dollar has been devalued more than 50 per cent, the safety performance of the AMCCW *wheel has increased 200 per cent!*

For more complete information about the advantages of AMCCW chilled car wheels, send for the booklet, "GENTLEMEN OF THE JURY."

Low first cost
Low exchange rates
Reduced inventory
Short haul delivery
Increased ton mileage
High safety standards
Complete AMCCW inspection
Easier shop handling

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

445 North Sacramento Boulevard, Chicago 12, Ill.

American Car & Foundry Co. • Southern Wheel (American Brake Shoe Co.)
Griffin Wheel Co. • Marshall Car Wheel & Foundry Co. • New York Car Wheel Co.
Pullman-Standard Car Mfg. Co.

the Harron, Rickard & McCone Co. of southern California. Mr. Carroll rejoined American Hoist as general sales manager in 1949.

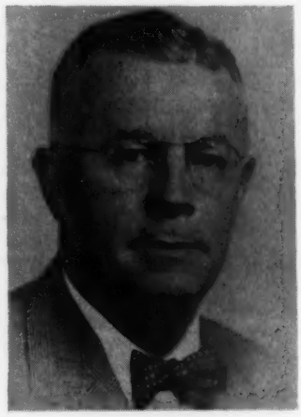
◆

NATHAN MANUFACTURING COMPANY.—*Wilbur C. Rice*, consulting engineer for the Nathan Manufacturing Company, New York, has been named vice-president in charge of manufacturing.

◆

AMERICAN LUMBER & TREATING CO.—*Edward B. Wilber*, formerly district sales manager for the Aluminum Company of America, has been elected president of the American Lumber & Treating Co., Chicago, succeeding *J. F. Linthicum*, who has retired. Mr. Mr. Linthicum will continue as a director of the firm.

Mr. Wilber began his career with the Aluminum Company as a sales apprentice immediately after he was graduated from Oberlin College in 1920. He worked in sales positions in Oklahoma and Texas until his appointment as manager of the



E. B. Wilber

Washington, D. C., office. In 1943 he was appointed district manager at New York and from 1945 to 1946 worked as a member of the metallurgical division of the U. S. Group Civilian Control Council in Germany.

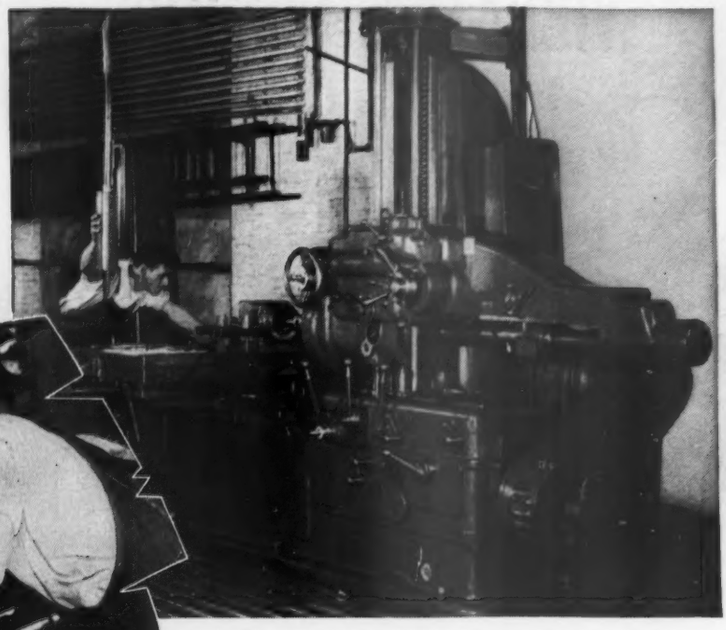
◆

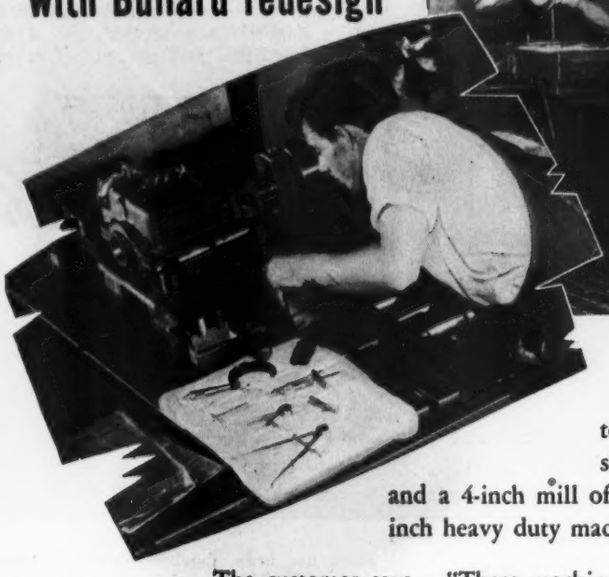
BAKER-RAULANG COMPANY.—The Baker Industrial Truck division of the Baker-Raulang Company has appointed three new sales and service representatives as follows: In the New York metropolitan area and northern New Jersey, the Baker-Raulang N. Y. Corporation and the *Material Handling Equipment Company* have been combined into a new organization—the *Material Handling Equipment Company*—with offices at 141 East 44th street, New York 17. In central and northeastern New York the *Material Handling Company*, 712 State Tower building, Syracuse, N. Y., has been appointed to handle all sales, service and engineering for Baker. The Houston, Tex., branch of the *Dillon Scale & Equipment Co.*, 4014 Navigation boulevard, will represent the company in the area of Texas which borders the Gulf of Mexico.

A New Plus to

Consistent Service

Good machines those Universals—BUT NOW Even Better machines with Bullard redesign





Out of 6 Universal Boring Machines in one customer's shop, two are more than 30 years old and still show good performance. A 3-inch mill is 3 years old and a 4-inch mill of about the same age. Furthermore there is another 4-inch heavy duty machine and a 3-inch about a year old.

The customer says — "These machines possess Reliability and great Flexibility. They meet our requirements because our work is so diversified and yet we require a very accurate machine for back boring, which is a complicated operation done accurately on these machines."

The foregoing bespeaks Consistent Service from the old line of machines. NOW the new heavier design with 4-WAY BED, features providing longer useful life with maintained Accuracy, hydrodynamic main drive with brake motor, Traybon lubrication system for ways and external bearings make Bullard Horizontal Boring, Milling and Drilling Machines an important item for your very earnest consideration.

THE BULLARD COMPANY · BRIDGEPORT 2, CONN.

Ask a **BULLARD** representative to outline the application of a **BULLARD** Horizontal Boring Mill to your work.

A. M. Byers Company.—*A. B. Drastrup* has been appointed assistant to the president of the A. M. Byers Company, Pittsburgh, Pa., in addition to his position as manager of steel sales, and *Buckley B. Byers*, formerly assistant manager of the New York office and manager of export sales, has been appointed assistant manager of steel sales, at Pittsburgh.

A. B. Drastrup

B. B. Byers

◆

Independent Pneumatic Tool Company.—*Clarence B. Bergren*, service engineer for the Independent Pneumatic Tool Company, in the St. Louis, Mo., territory, has been appointed Cleveland, Ohio branch manager, succeeding *William J. McGraw*. Mr. McGraw has been appointed manager of the New York branch to succeed *Edward W. Krantz*, who has been appointed Pittsburgh, Pa., manager, succeeding *John B. Dempsey*. Mr. Dempsey has been appointed manager of the Detroit, Mich., branch.

◆

Aluminum Company of America.—*Lewis P. Favorite* has been appointed manager of the New York district office of the Aluminum Company of America, succeeding *Edward B. Wilber*.

Mr. Favorite joined Alcoa's Detroit, Mich., sales office in 1927. In 1940 he was transferred to the New York district sales office and in 1944 he returned to Detroit as assistant district sales manager. Mr. Favorite was appointed St. Louis, Mo., district sales manager in 1948 and in October 1950, was appointed product manager of die castings.

ESSO COBLAX

"Tailor-made" to railroad specifications

The Sign of QUALITY — Esso — The Symbol of SERVICE

RAILROAD PRODUCTS

SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Penna., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, W. Va. — Charlotte, N. C. — Columbia, S. C. Memphis, Tenn. — New Orleans, La.

ESSO COBLAX LUBRICANTS

have been specifically developed to provide highly dependable gear lubrication for traction motor drives on electric and diesel-electric locomotives; gas electric and multiple-unit cars; and many other locomotive and car lubrication requirements. Esso COBLAX is availabe in a wide range from fluid oils to semi-solid products... "tailor-made" for railroad applications.

BACKED BY CONSTANT RESEARCH

—keeping pace with latest engine design and developments. Esso Railroad Products are constantly being tested and improved.

BACKED BY CONSTANT FOLLOW-UP

—on-the-job check-ups by Esso Sales Engineers assure dependable performance of Esso Railroad fuels and lubricants! Be sure to call on ESSO for any fuel or lubricating problem.

GENERAL REFRACTORIES COMPANY.—*Jay B. Tracy, Sr.*, has been appointed manager of railroad sales and service of the General Refractories Company, Philadelphia, Pa.

◆

FAIRBANKS, MORSE & CO.—*C. H. Morse, Jr.*, has been appointed manager, locomotive service department, Railroad division, of Fairbanks, Morse & Co. Mr. Morse succeeds *J. E. Justus*, who has retired. Mr. Justus will devote part time to the firm on a special assignment basis, with the title

C. H. Morse, Jr.

of special assistant to manager of the railroad division. Mr. Morse has for the past 18 months served as assistant manager of the locomotive service department, and also more recently as district manager of locomotive sales in the Chicago district. His headquarters will be in the firm's Chicago office, 600 South Michigan avenue.

◆

LORD MANUFACTURING COMPANY.—A. G. *Postlethwait*, president for the past 15 years of the National Bank & Trust Co., Erie, Pa., has been elected vice-president of the Lord Manufacturing Company at Erie, The company has opened a new field office in Dallas, Tex., at 1613 Tower Petroleum building, with *Bruce O. Todd* in charge.

◆

ARCOS CORPORATION.—The Arcos Corporation has opened a west coast office and warehouse at 427 South Western avenue, in Los Angeles, Cal. *B. E. David* has been appointed district manager.

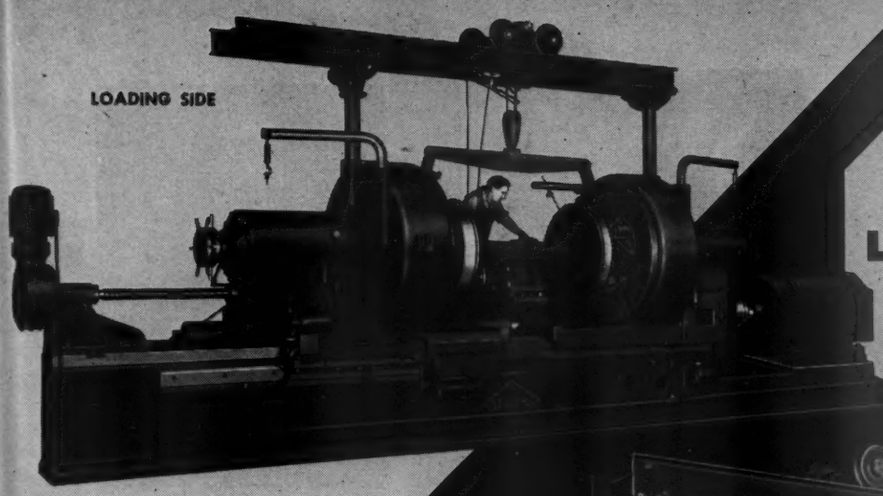
◆

ARMSTRONG CORK COMPANY.—*Howard Stampf, George A. McCormick*, and *Donald L. Davidson* have completed the sales course offered by the Armstrong Cork Company's Industrial Division Sales Training Class and have been assigned, respectively, to the district offices at Cleveland, Ohio, Chicago, and St. Louis, Mo.

◆

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*Frank L. Murphy*, formerly chief engineer of the Pullman-Standard Car Manufacturing Company, has joined the company's sales staff at Washington, D. C., as assistant vice-president.

Mr. Murphy began his business career with Pullman-Standard as a draftsman at the passenger-car shops at Chicago in 1922, following graduation from Purdue Univer-



GET GREATER PRODUCTION AT LESS COST IN YOUR DIESEL LOCOMOTIVE AND CAR WHEEL TURNING

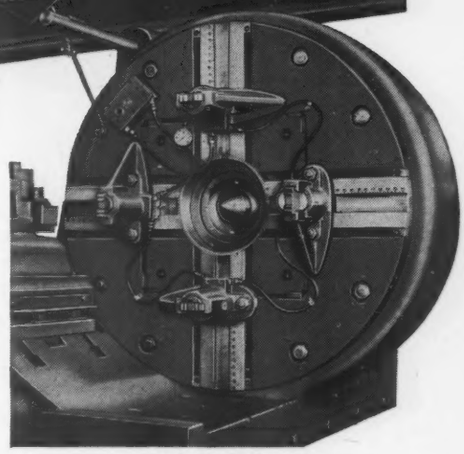
SELLERS 50" DIESEL LOCOMOTIVE AND CAR WHEEL LATHE

OPERATOR'S SIDE

Among Railroad Tools built by Consolidated are . . .

CAR WHEEL BORERS
DIESEL WHEEL BORERS
BURNISHING LATHES
TIRE MILLS
END DRIVE AXLE LATHES
CENTER DRIVE AXLE LATHES
JOURNAL TRUING LATHES
DRIVING WHEEL LATHES
CAR WHEEL LATHES
RADIUS LINK GRINDERS
PROFILE MILLING MACHINES
SLAB MILLING MACHINES
ROD MILLING MACHINES
CYLINDER BORING MACHINES
KEYWAY MILLING MACHINES
CRANK PLANERS
DRILL PRESSES
AND OTHERS

The Sellers 50" Diesel Locomotive and Car Wheel Lathe turns diesel locomotive and car wheels from 28" to 50" tread diameter. Designed with speed range suitable for either carbide or high speed steel tools. Two mechanical speed changes in conjunction with a variable speed 75 H.P. motor provide speed ranges of approximately .9 to 3.6 R.P.M. and 5 to 20 R.P.M. of face plate, with instantaneous speed selection. Faceplates are recessed, and furnished with removable filler blocks, for turning diesel wheels, motor coach wheels and trailer wheels equipped with roller bearings.



Four self-equalizing hydraulic drivers on each faceplate insure equalized pressure on wheel rims

Complete information covering this modern machine will be furnished upon request. Let us show you how it should help to save you money while increasing your production.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

F. L. Murphy

sity's engineering school. In 1935 he was appointed principal engineer directing design and development of lightweight streamline trains. From 1942 until 1950 Mr. Murphy served as chief engineer of the company, directing all engineering, including design, experimental and research work on railroad passenger cars, freight cars and street transit equipment.

◆

BLACK & DECKER MANUFACTURING CO.—Black & Decker has opened a sales and service branch at 881 W. Delavan avenue, Buffalo 9, N. Y. The new building covers over 4,100 sq. ft. The company has also purchased approximately 180 acres of land at Hampstead, Md., where a plant will be built to provide additional facilities for the manufacture of portable electric tools.

◆

VAPOR HEATING CORPORATION.—The Vapor Heating Corporation, Chicago, has announced transfer of the following sales and service personnel: *H. E. Nichols*, from Cleveland, Ohio, to New York; *R. C. Smykal*, from New York to Cleveland; *J. H. Paulding*, from the main plant at Chicago to Harrisburg, Pa.; *J. Murray*, from Harrisburg to Philadelphia; and *M. K. Loomis*, from Philadelphia to the general office at Chicago.

◆

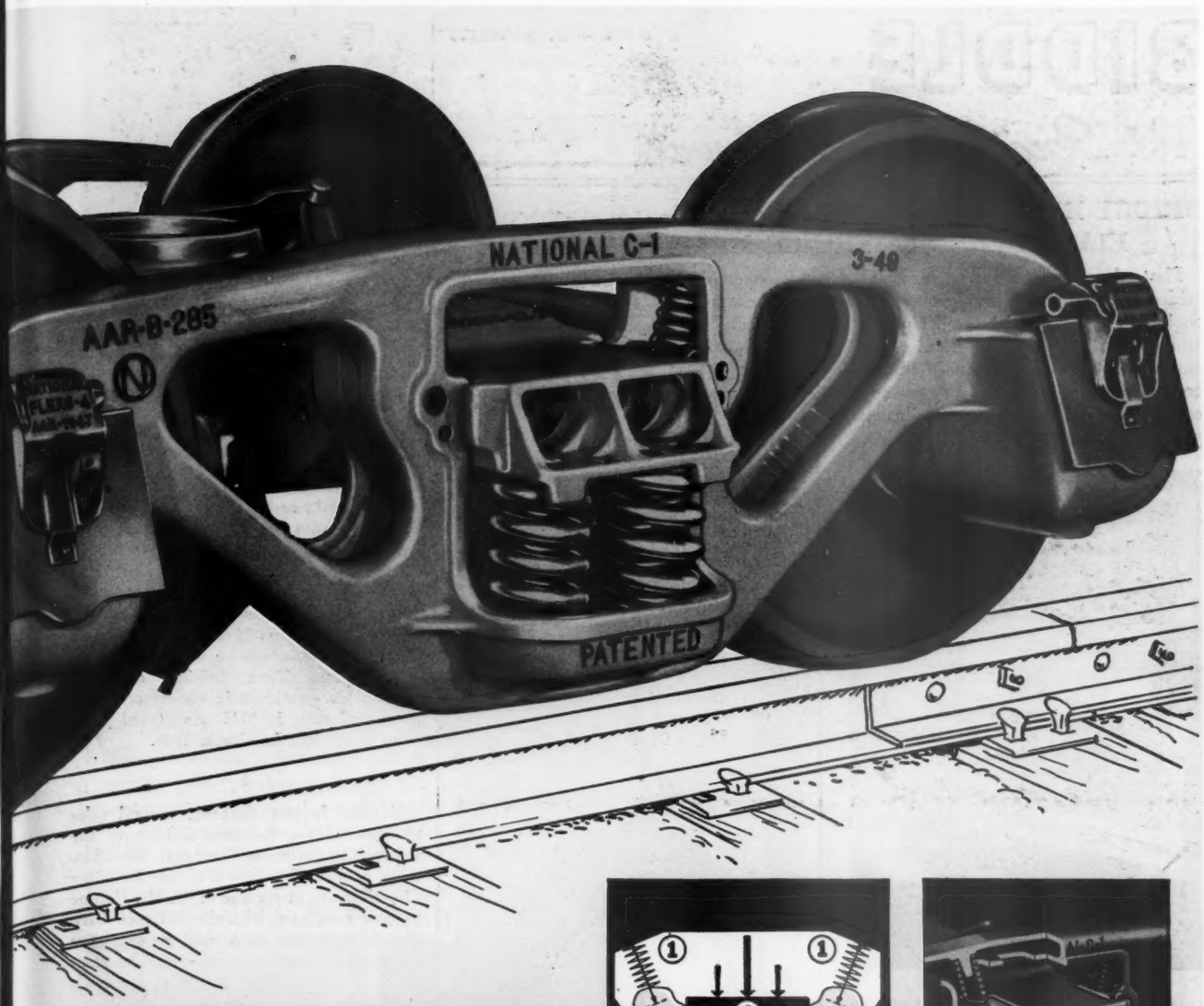
PYRENE MANUFACTURING COMPANY.—*Wallace B. Phillips* has been elected president of the Pyrene Manufacturing Company, Newark, N. J., succeeding Edward J. Waring, who retired in August 1950.

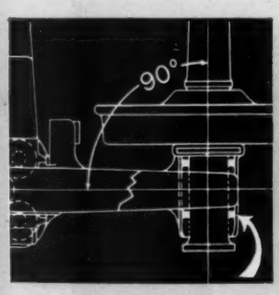
Obituary

EDWARD LOUIS HOLLJES, general sales manager of the William Sellers Company division, Consolidated Machine Tool Corporation, died on February 3. He was 66 years old.

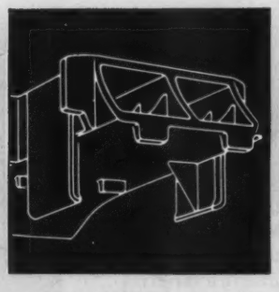
◆

ERNEST MURPHY, former president of the Pressed Steel Car Company, died on March 4 at his home in Wilton, Conn. Mr. Murphy was 67 years old. He was born in Padiham, England, and received his early education and training in that country. He came to the United States in 1909 and in the same year became division engineer of the Butler, Pittsburgh, Harmony & New Castle Interurban Traction Co. In 1911 he joined

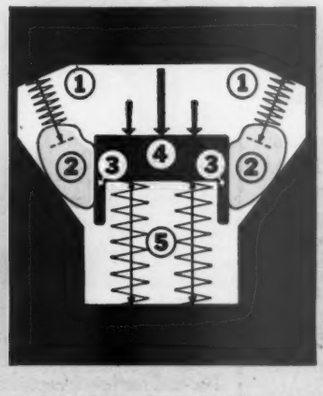


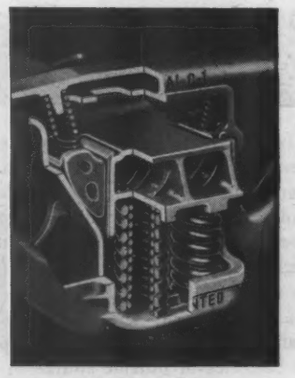


5 JOURNAL BEARING LUG PROTECTION. Four journal bearing wedge aligning lugs in each journal box limit truck unsquaring, preventing breakage of journal bearing lugs.



6 FULL BOX-SECTION BOLSTER . . . Friction mechanism in side frame controls both lateral and vertical motion . . . permits full box-section bolster of maximum torsion and bending resistance.





INSIDE STORY OF A "LADING-CONSCIOUS" RIDE. Constant pressure of wedge springs (1) forces friction wedge (2) down side frame against bolster wear plates (3), providing friction to control the vertical and lateral oscillations of the supporting springs. Car floats on full box-section bolster (4) & standard spring groups (5).

The National Malleable and Steel Castings Company, Cleveland 6, Ohio

CASTINGS COMPANY

JOURNAL BOXES AND LIDS

NATIONAL *Products*

FOR TRANSPORTATION AND INDUSTRY

Est. 1868

Ernest Murphy

the Interborough Rapid Transit Company at New York, and from 1917 to 1940 was associated with the United Traction Company at Albany, N. Y. At the same time, he was also president of the Capital District Transportation Company in Albany. Mr. Murphy became associated with Pressed Steel Car in March 1951, at its Hegewisch plant, Chicago, where he was in charge of the Armored Tank division. He later became vice-president in charge of operations, and early in 1945 was elected president. He retired in March, 1948.

◆

EDWARD JOSEPH HELLINE, general sales manager of the Reliance division of the Eaton Manufacturing Company, Massillon, Ohio, died on February 8 in the Massillon City Hospital, at the age of 48. Mr. Helline became associated with the Reliance Division 32 years ago as a mail clerk. Before assuming the position of general sales manager, he had advanced through the advertising and sales departments. Subsequently he served as manager of the order and billing department, manager of the service department, assistant to the general sales manager and assistant to the general manager, and was in charge of snap ring sales, engineering and production. He became general sales manager in June, 1947. Mr. Helline was chairman of the standards committee of the Spring Washer Institute.

E. J. Helline

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

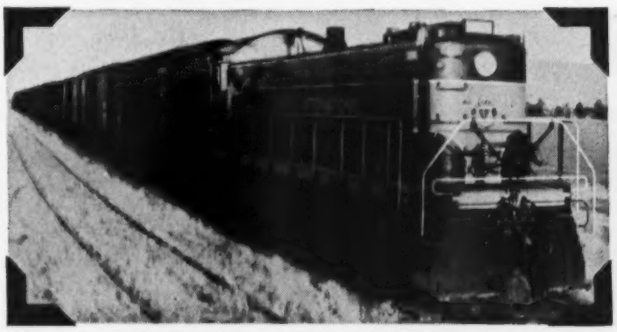
UNIT Alco Diesel – 6 cyl. 12½" × 13" – 1000 H.P.

SERVICE Mountain haul – Heavy snow, extreme cold

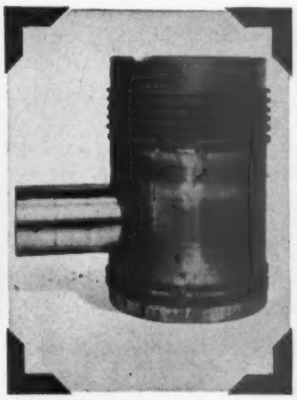
LOCATION Spokane, Wash. – Yahk, B.C.

FIRM Spokane International R.R. Co.

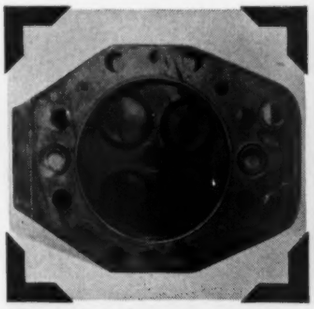
Engines in "perfect condition" after year of toughest service!

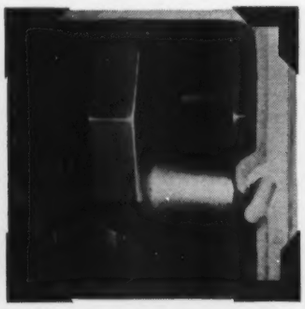


LUBRICATED WITH RPM DELO Oil R.R., nine new diesels owned by the Spokane International R.R. Company were kept in regular service for one year. The winter was exceptionally severe and the locomotives bucked heavy snow almost daily. They worked or were idled in temperatures that often for periods of ten days averaged from 20 to 40 degrees below zero.



On inspection at the end of that time there were no accumulations of sludge in oil systems and the engines were in "perfect condition" as pictures of parts from one of them indicate.



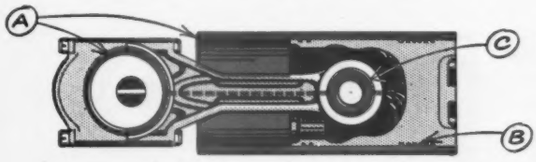


NO CARBON had collected on the cylinder head and all rings were free and functioning properly. Connecting-rod and main bearings and wristpin were within standard tolerance. Measurement of the liner showed less than 0.001 inch wear.

REMARKS: The Spokane International Railroad provides an important connecting service between transcontinental lines through Spokane and the Canadian Pacific to the north. Most of their trackage is in northern Idaho where severe weather and other conditions often make operation difficult. RPM DELO Oil R.R. will meet the toughest weather or operational conditions in all locomotive diesel engines.

RPM DELO LUBRICATING OILS

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities . . . keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer . . . prevents ring-sticking. Detergent keeps parts clean . . . helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of bushing or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF

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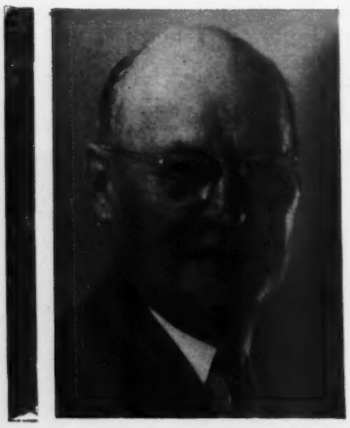
PERSONAL MENTION

General

FRANK BITTNER, superintendent of motive power and car equipment of the Quebec district of the Canadian National at Quebec., Que., has retired. Mr. Bittner was born at Pittsburgh, Pa., and entered railroad service in 1904 as a machinist apprentice. From October 1908 to June 1917 he was machinist at various points with the Quebec, Montreal & Southern (now C.N.), later becoming erecting shop foreman, fitter, locomotive fireman and machine shop foreman. He was appointed assistant foreman of the C.N. in October 1929; night locomotive foreman at Janquiere, Que., in 1930; locomotive and car foreman at Taschereau, Que., in April 1937; lomotive foreman at Limoilou in 1941 and superintendent motive power and car equipment of the Quebec district in August 1943.

FRED WARNER BELLINGER, has been appointed general manager of the Butte, Anaconda & Pacific, at Anaconda, Mont. Mr. Bellinger was born on September 18, 1886, at Cannon Falls, Minn. He entered railroad service in the summer of 1906 as



F. W. Bellinger

an electrician on the Great Northern, and subsequently was traveling electrical foreman and, later, chief electrician in charge of Cascade tunnel electrification. From 1912 to 1913 he was associated with the Consumers Power Company at St. Paul, Minn., and the Northern Mississippi River Development Company at Minneapolis, joining the B. A. & P. in 1913 as electrical superintendent at Anaconda. In 1932 Mr. Bellinger was appointed mechanical and electrical superintendent and in 1943 superintendent, in which capacity he served until his appointment as general manager.

H. S. MCTEER, locomotive foreman of the Canadian National at Limoilou, Que., has been appointed superintendent of motive power and car equipment of the Quebec district at Quebec, Que.

Car Department

B. F. Orr, superintendent of the Beech Grove, Ind., car shop of the New York Central, after 45 years with the company.

John A. Brossart, assistant to general superintendent equipment-car of the New York Central system at New York, who has retired as announced in the March issue, was born in Aurora, Ind. He attended high school and in 1903 became a

J. A. Brossart

car inspector in the employ of the Cleveland, Cincinnati, Chicago & St. Louis at Brightwood, Ind., serving subsequently as assistant foreman and foreman, respectively, until April 1914, when he was appointed general foreman at the Beech Grove, Ind., car shops. In 1925 he was appointed shop superintendent and in 1927 superintendent rolling stock. In 1934 he became assistant to general superintendent rolling stock of the New York Central system at New York, and on January 1, 1949, assistant to general superintendent equipment-car. Mr. Brossart retired on January 1 of the present year. He is a member of the New York Railroad Club and the New England Railroad Club.

Frank J. Kossuth, who has been appointed assistant to general superintendent equipment—car of the New York Central system, with headquarters at New York,

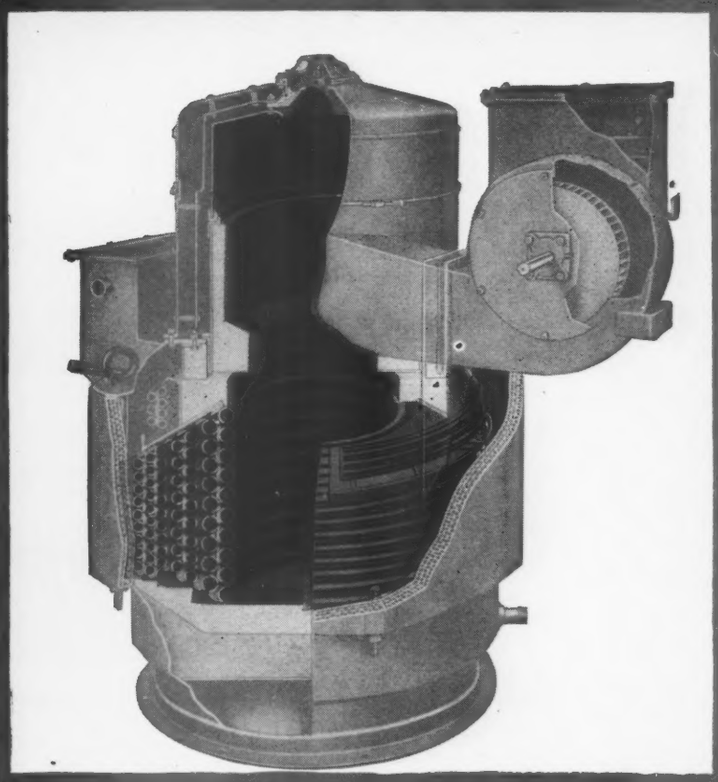
F. J. Kossuth

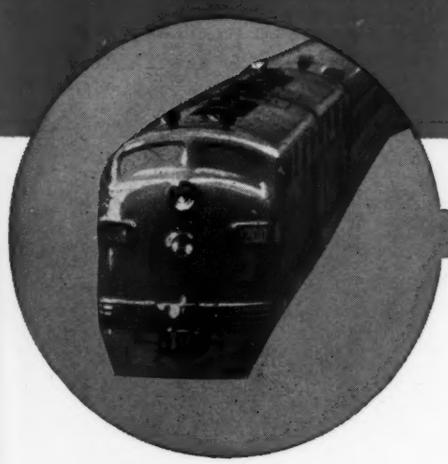
Simplified

STRAIGHT-THRU SINGLE PASS CIRCULATION

VAPOR STEAM GENERATOR

An *exclusive* Vapor development which means that every bit of water in the coils must go through all of the heating surfaces *without any of it being bypassed or short circuited through alternate paths.* Up to 1,000,000 miles of coil life is available thru Vapor's One Pass Water Circulation with Simple Water Treatment.





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HIGH EFFICIENCY. STEAM GENERATOR

. . . uses less water per pound of steam delivered at the train line and it delivers this steam at 99.5° of dryness.

Its extremely high oil burning efficiency evaporates 13 pounds of water to 1 pound of fuel oil. (Over 84% efficiency)

Vapor Steam Generators speed up train schedules by requiring fewer stops to take on water and by delivering *more mileage out of a tank of water* than any other type of steam generator. Vapor Steam Generators are lowest in initial cost, lowest in maintenance cost, and offer the highest reliability.

Congratulations to the Illinois Central Railroad on its 100th Anniversary.

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as announced in the March issue, was born at Cleveland, Ohio, on May 24, 1909. He entered the employ of the New York Central at Collinwood, Ohio, as a carman apprentice in 1927. He left in 1941 as fabricating freight foreman at Beech Grove, Ind., to enter military service with the 753rd Railway Shop Battalion. After four years overseas in Africa, Italy, and the Philippines, Mr. Kossuth returned to the New York Central in 1946. He was appointed assistant superintendent of equipment, eastern lines, on August 1, 1948.

C. C. CORNEILS, general foreman, passenger car repairs, of the Chicago, Burlington & Quincy, at Aurora, Ill., has been appointed assistant superintendent of shops at Aurora.

Master Mechanics and Road Foremen

PAUL LUCAS has been appointed assistant master mechanic of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Milwaukee, Wis.

O. M. HOENSHELL, master mechanic of the Lincoln-Omaha-Wymore divisions of the Chicago, Burlington & Quincy at Lincoln, Neb., has retired after 52 years of service.

H. F. ROESCH, assistant master mechanic of the Casper-Sheridan divisions of the Chicago, Burlington & Quincy at Sheridan, Wyo., has been appointed master mechanic of the divisions.

J. L. SHAFER, general foreman of the Chicago, Burlington & Quincy at Greybull, Wyo., has been appointed assistant master mechanic at Sheridan, Wyo.

B. F. MELIGAN, master mechanic of the Casper-Sheridan divisions of the Chicago, Burlington & Quincy at Casper, Wyo., has been appointed master mechanic of the McCook division with headquarters at McCook, Neb.

C. E. BLOOM, master mechanic of the Chicago, Burlington & Quincy's McCook division at McCook, Neb., has been transferred to the position of master mechanic of the Lincoln-Omaha-Wymore divisions, with headquarters at Lincoln, Neb.

NEW DEVICES

(Continued from page 90)

construction to give efficient operation and there are no delicate relays, rectifiers, fuses or open arcing contacts.

Improved Spiral Milling Attachment

An improved spiral milling attachment, whose spindle is mounted on anti-friction bearings and spindle nose conforms to the No. 40 standard milling machine is now available from The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. It increases the variety of set-ups which may be handled on the Cincinnati units.

The attachment was designed for the milling of helical and spiral gear teeth. Its double swivel construction makes it

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HOW TO GET More Production . . . Less Maintenance

QUAKER'S COMPLETE PLAN FOR LONGER PRODUCTIVE LIFE FROM INDUSTRIAL RUBBER PRODUCTS

Now, to meet the need to produce more with less, put the QUAKER Conservation Maintenance Plan to work in your operations.

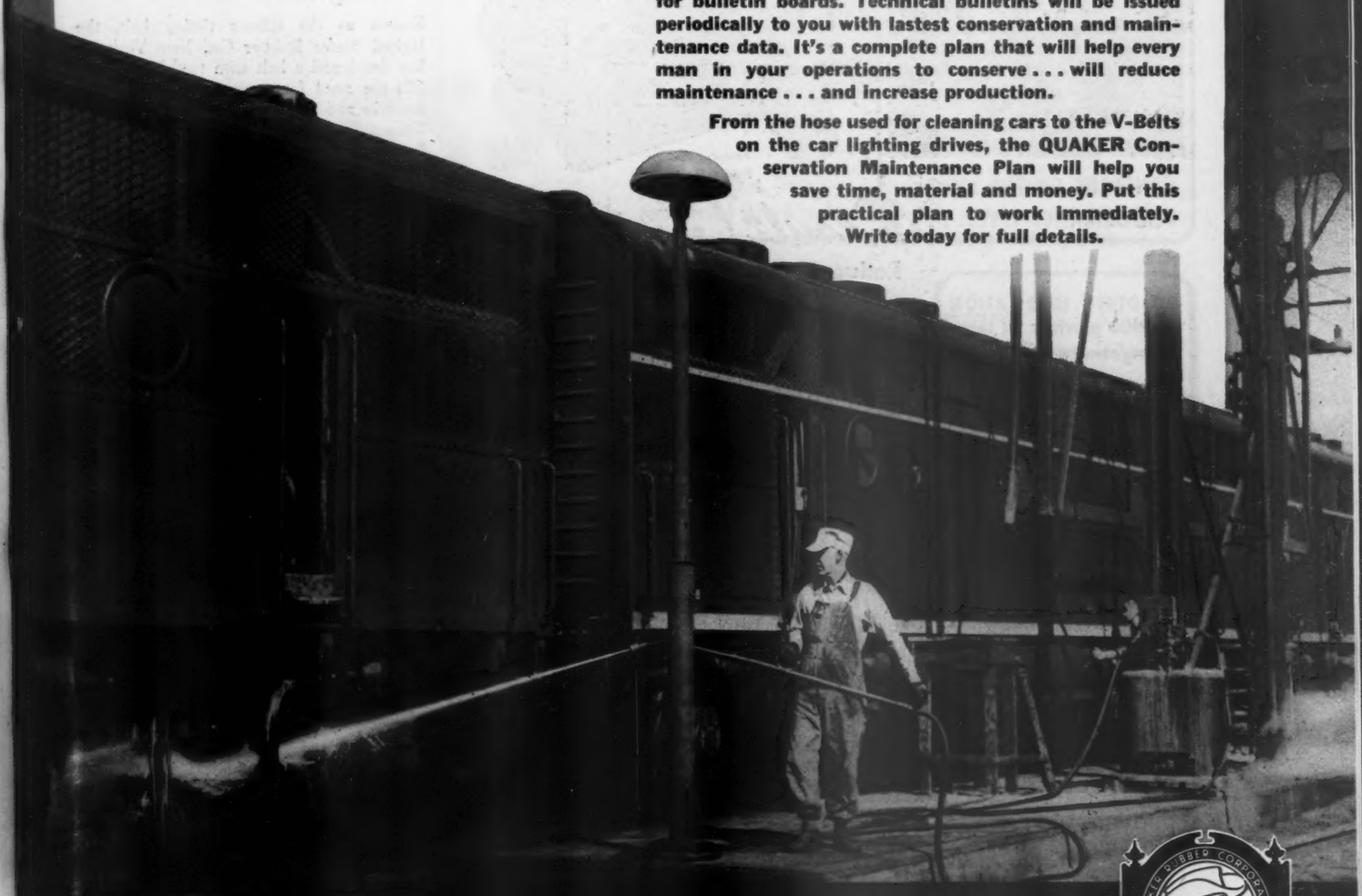
Developed by Quaker Engineers to help you get more production out of your industrial rubber products with less maintenance, this plan is practical and easily applied by any man in your operations.

QUAKER C M P includes a big factual booklet on how to make conveyor and transmission belting, hose, packings and molded products last longer. Charts are available for bulletin boards. Technical bulletins will be issued periodically to you with lastest conservation and maintenance data. It's a complete plan that will help every man in your operations to conserve . . . will reduce maintenance . . . and increase production.

From the hose used for cleaning cars to the V-Belts on the car lighting drives, the QUAKER Conservation Maintenance Plan will help you save time, material and money. Put this practical plan to work immediately. Write today for full details.

GET YOUR COPY

of this big factual booklet and other helpful data of the QUAKER C M P program. No charge, no obligation. Yours to help you get more out of industrial rubber products.



QUAKER RUBBER CORPORATION

DIVISION OF H. K. PORTER COMPANY, INC.

PHILADELPHIA 24, PENNA. BRANCHES IN PRINCIPAL CITIES

suitable for vertical and angular milling in tool and die shops, production and maintenance shops.

On a machine of current design and practically all old designs of Cincinnati plain and universal millers, this improved device eliminates the usual 45 deg. limitations for the swivel range of the table, and extends it to 90 deg. or more.

Large diameter swivel bearings promote rigidity when taking heavy cuts, and hardened alloy steel gears provide ample strength. Rigidity at the outer end of the attachment is obtained by a supporting stud which fits into the angular machine arbor support.

Elevator Increases Welder's Flexibility

When the Great Northern rebuilt 400 ore cars, the Unionmelt flexible welder, a product of The Linde Air Products Co., Unit of Union Carbide & Carbon Corp., New York 17, was used for many operations. Welds were made at high speed in places hard to get at with other automatic welding machines, the flexible hose and nozzle covered an area of 1,000 sq. ft.

By using an air-operated elevator device to raise and lower the rod and melt feed machine, the range for one of the operations on the new car baskets was increased 80 per cent. In the upper position, plug welds were made through rivet holes on re-used side stakes. Lowered, the flexible welder was used to make butt welds between end and side slope sheets.

Goggle Padding Mask

A molded rubber detachable padding mask for Willson heavy duty cover-all safety cup goggles has been announced by Willson Products, Inc., Reading, Pa. The product assures an extra tight fit for better protection in welding, chipping, heavy dust and acid operations.

The padding mask is attached to the goggles by means of a beaded molding which slips over the rims of the eyecups, providing a firm, light-tight joint. It is replaceable, and can be changed without the use of any tools. The soft, molded rubber assures a snug, comfortable fit for all shapes of faces. Also, the mask provides added clearance when goggles are worn over prescription spectacles.

The mask may be purchased as an accessory with Willson cup goggles, or may be bought separately for application to goggles already in use.

Rubber and Fabric Timing Belt

Known as the Gilmer timing belt, the United States Rubber Co., New York 20, has developed a belt with teeth which fulfills the need for a power drive that will not slip and permits split-second precision timing. It will attain speeds up to 16,000 ft. per min. and operate more quietly than precision gears running in an oil bath.

The belt has replaced flat belts, V-belts, chain drives and gears in hundreds of applications. It can also be used as a funcitonal part such as a synchronized conveyor as well as for transmitting power.

This product has been tested in fan belt service by two automotive manufacturers and found to wear two to five times longer

than V-belts. In automotive camshafts, it has been found to withstand more than 100,000 test miles of service without failure or retiming. On portable chain saws it provides power to take the severe punishment caused by instantaneous stalls.

In appearance, the belt is similar to a flat belt except that it has regularly spaced rubber teeth along its inner surface which engage in corresponding grooves in the pulleys. It can be manufactured in any desired size and in a variety of materials to suit specific applications.

The belt requires no lubrication and oil will not harm it. It is unusually compact and speed ratios up to 30 to 1 are possible and the belt's extreme flexibility permits pulley diameters as small as ½ in. at 10,000 r.p.m. even with a heavy load.

Wet-Grinding Valve Refacer

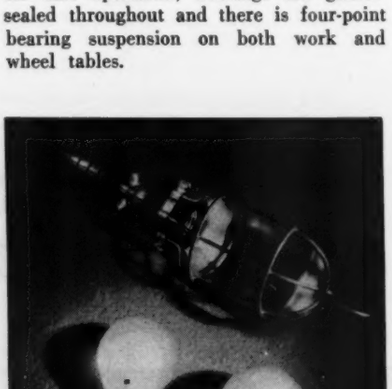
The Super-Service Valve Refacer, a completely new device has been introduced by The Black & Decker Mfg. Co., Towson 4, Md. This hypoid-gear-driven wet-grinding refacer supersedes all previous Black & Decker models.

An outstanding feature of the unit is that it will traverse grind all valves from 0 to 90 deg. It handles valve stems from $^{9}/_{32}$ to $^{11}/_{16}$ in. and has a valve head capacity up to 4 in. in diameter. The wheel head is at a 20 deg. offset permitting traverse grinding of any angle valve face including the flat type. No attachments are needed and plunge grinding is eliminated.

This machine is supplied with two collets and a hand wheel on the back of the work head has a double lead thread for giving quick clamp action on the stem in the collet. It is equipped for wet grinding allowing for cooler, faster grinding. A reservoir in the base holds 1 gal. of coolant and contains baffle plates to settle the grinding sediment.

Attachments for grinding valve stems, tappets and rocker arms are supplied as standard equipment. The wheel dressing attachment also standard equipment, is mounted on the work table and can be swiveled out of the way without removing when refacing a valve.

Wheel guards are cast integral with the wheel head; the motor for the wheel head as well as the coolant pump are in the base; wires, tubes, etc., are enclosed for safe operation; bearings are grease-sealed throughout and there is four-point bearing suspension on both work and wheel tables.



Rough-Service Lamp

A smaller, 100-watt rough-service lamp that fits standard wire-guard extension-cord equipment is available from Westinghouse Electric Corporation. Applicable to all types of rugged service, this lamp emits more light from a smaller, more breakage-resistant bulb.

The new bulb is $2^{5}/_{8}$ in. in diameter, ¼ in. less than the former A-23 bulb. With a maximum length of $5^{5}/_{16}$ in. from top of bulb to bottom of base, it is ¾ in. shorter than the A-23.

Voltage ratings of the new lamp range from 115- to 300-volts, have corresponding approximate average initial lumens of 1,210 to 750. All ratings are designed for a life of 1,000 hr.

All 100-watt rough-service lamps of clear glass or inside frosted glass are now manufactured in the smaller size.